THE

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ELECTRICAL REVIEW.

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CHINA CALLS TO THE BRITISH MANUFACTURER.

SEVERAL years ago we implored our readers to do all that lay in their power to secure for Great Britain a reasonable share of the future electrical and engineering trade of China. We made the appeal, as powerfully as we knew how, for a personal intelligent investigation of the whole situation. We adopted a style a little more direct than is generally desirable, owing to the urgency of the question, and we entitled our article "You are Wanted in China!" expecting that section of our readers who are responsible in such matters to place their own emphasis upon the "You."

We have no complaint to make respecting the attention given to the call, for interesting and earnest attempts are to-day in progress which were not then, attempts which should do something to strengthen our position in a market where it is imperative that we should be very much alive. But the few efforts that we have in mind, worthy as we know them to be, are indeed small when one compares them with the enormous needs of 400 millions of people whose leaders, at any rate, are on their feet and alert, while vast hosts of others are awakening out of the long national sleep. Awakening for the multitudes of China means Westernisation, or what we call Civilisation, and Civilisation—be it good or bad is not the question—means needs never before experienced, as Mr. E. T. Williams shows in his article on another page. Westernisation means more railways, coal and iron mines development, sanitation and numerous other public works; it means industrial enterprise, including factories; it suggests universities and new colleges and schools; it means electric light and power and traction, telegraphs and telephones; it means hospitals and scientific apparatus, and in the end — years and years hence maybe, when we in these islands have used and exported more of our coal supplies, unless Providence show a continuous regard for the well-being of Western races, perhaps the Yellow Peril, which we are sometimes inclined to pooh-pooh. That eventuality, however, need not make us turn in our sleep at the moment—posterity will be able to handle its own problems.

Unpractical ideas and ideals dismissed, we regard civilisation and all that it means as something greatly to be desired for the China of to-day and her millions, and we are up against this very practical proposition: Civilisation is inevitable; the cultivation of trading relations promotes international friendship; the assistance of "the foreigner" is required; British manufacturers are equipped for just this sort of enterprise—our engineers and contractors have left their object lessons in every quarter of the globe, and we need to secure our own people's well-being at home by foreign trade expansion. What, then, is to prevent our going in and securing a large share of trade in territories

which during the next 50 years or so must yield a wonderful harvest?

Without unduly repeating our earlier observations respecting the greatness of the opportunity, we would say that we are at the beginning of a great movement—let us see to it that we are at the head of it! Our foreign competitors have whetted the edge of their commercial weapons—listen to Shylock's knife upon the stone!—and if in our own short-sightedness we leave our place unoccupied, or hold it only weakly, they will be there. There is proceeding among the nations such a struggle for Far Eastern trade as was never before witnessed, and, unless we throw off our apathy and our trust in our past reputation, the future of the British trader in China will be as that of the Turk in Europe—so far as prestige is concerned we shall be told to quit! Let the reader not imagine that at our time of life we are in a mood for panic—the position is not lost yet, but the great guns have been brought against it, and the resources of modern international competition are being used by Germany and America alike, demanding of us as Englishmen that we shall summon all our forces and secure what we hold already, and fight our way to full possession of fields which now, in a trading sense, present great opportunities.

Remember that the rising generations in China know as well as we do what must come with the progress of civilisation within their vast Empire. Remember that thousands and thousands of their leaders have learned in civilised countries what time has wrought in them. Remember that many have acquainted themselves intimately with the manufactures of those countries, and have returned home with an indelible impression. Remember that they sit at the feet of European and American teachers of science and engineering. They thus are prepared to go forward. Are we? They know that, however rapidly the country progresses in general ways, it must be many years before they can possibly manufacture electrical machinery and apparatus and engineering material within their own borders to a hundredth part of the extent that speedily advancing civilisation must entail. Mining, railway and water-power work will demand much of their attention first—cannot the British people of the next decade or two hope to do a fair share of the electrical work that they are unable to do for themselves?

We print the foregoing thoughts as food for careful digestion, and hope that none will think that we exaggerate either the scope or the urgency, but we are anxious for these observations to immediately eventuate in something tangible. To that end we ask our electrical and engineering manufacturing and trading friends to turn to an article appearing in our following pages from the pen of Prof. C. A. M. Smith, who has recently arrived in Hong Kong, and taken up his post as Professor of Engineering at the University there. Geographically, Hong Kong leaves nothing to be desired from the standpoint of British trade. Chinese engineering students will doubtless before long throng the University classrooms and laboratories in search of knowledge. In these laboratories or workshops they will be familiarised with steam and electrical machinery and apparatus—whose shall it be? German? American? or—in a *British* University—*British*? That is a point our manufacturers can settle with little more than a thought. They can, if they will, have working representatives right on the spot, in the hands of young China—the future purchaser—with British name-plates which will tell a lasting tale. Here is an investment that should in days to come—sooner as well as later—yield an incalculable return. Who will be the first to grasp the opportunity and send what is required? Shall the response be speedy and hearty too? The game is well worth while.

Prof. Smith, the writer of the article referred to, may be relied upon to maintain his reputation for energy, of which our own and certain newspaper pages, as well as the students of East London College, where he was one of the professors, have in the past borne their own witness. We have reasons for knowing that he accepted the invitation of the University of Hong Kong to organise the applied science work, at some considerable self-sacrifice. He has gone to China, voluntarily facing the inconvenience of isolation, climate, &c., for a remuneration less than he was earning in London, although well aware that the cost of living in the Far East is in excess of that of the Metropolis. Whether he would desire us to say this or not, it will serve to bring out what we know he would wish to emphasise in respect of the present Chinese position, namely, that a little immediate self-sacrifice on the part of our firms is what is required in order to make the Hong Kong University eloquent of the merits and claims of British engineering.

The Institution of Electrical Engineers.

On Thursday next the Institution in London will commence the first session under the new Articles of Association—in the provinces it has already been begun—and we hope to witness the inauguration, if not of a new policy (for the letter of the Institution's aims is not changed, as expressed in the Memorandum of Association), at any rate, of a new spirit, a new attitude towards its duties, and an enlightened conception of what those duties consist in. The Memorandum is one of those documents which may be casually perused by the initiate who has newly acquired the dignity of membership, but are rarely, if ever, consulted afterwards; it is, however, an interesting and significant declaration of the objects for which the Institution was established, which are broadly summed up in one of its clauses as being "To promote the general advancement of electrical and telegraphic science and its applications. . . ," and, in addition to certain specified proceedings, "to do all such other lawful things as are incidental or conducive to the attainment of the above objects."

Here is indeed a comprehensive programme, only a part of which has hitherto been adequately performed; but spurred on by the eloquence and enthusiasm of Dr. Ferranti, and fortified by the provisions of the new Articles and the augmented funds which their operation will place at the disposal of the Council, the Institution has now an unprecedented opportunity to prove its mettle, and to attain to a standard of efficiency that has until now been beyond its highest aspirations. In this it will but emulate, in the departments of administration and organisation, the marvellous achievements of the industry in the technical and scientific branches. The turbo-generator, the metal filament, the wireless telegraph, the Röntgen rays, the electron—these and other admirable inventions and discoveries have revolutionised the art and science of electrical engineering, and it is only fitting that the brain of the industry, the mechanism of control and organisation, should take part in the regeneration which is in progress and arouse itself to play the

leading *rôle* in the great developments which we hope to see realised in the near future.

Some hints as to directions in which the Institution might well take action are given in the interesting address of Mr. A. A. Day to the Manchester Local Section, of which we give an abstract elsewhere in this issue. Mr. Day, a pupil of Dr. Ferranti, directs attention to the disadvantages under which the industry labours, and which will delay the coming of the time when electricity is in universal use, unless every opportunity is taken to secure uniformity of system and concentration of effort. The immense advantage of uniformity would be felt by no one more than by the manufacturer and the contractor, whose diversity of designs and variety of stocks would be greatly reduced, while the cost of production would also be lowered. The possibility of linking up adjoining areas, and of concentrating the generating plant in large power stations, would be immensely facilitated, and thus the cost of supply would be diminished. The consumer would also benefit by relief from the present confusion as to the correct voltage of his lamps, the type of current for his motors, and so on. We confess that we have not much faith in Governmental intervention as a rule, but in certain cases it is indispensable, as in the case of wayleaves cited by Mr. Day. Curiously enough, Mr. Schofield also touched upon the question of uniformity, in his address to the Yorkshire Local Section, and both referred to the lessons of the coal strike.

Regarding the intentions of the Council under the new *régime*, the statement drawn up by Mr. Robert Hammond, after the special meeting of November 2nd last year, threw a good deal of light upon the points which exercised the minds of the members when they were confronted with the new articles. This statement, unfortunately, has not yet appeared—so far as we have been able to ascertain—in the *Journal* of the Institution, but we hope it will be placed on record amongst the *Proceedings*. Failing that, the gist of its contents, and of the Annual Report of May, 1911, which also dealt at some length with questions of future policy, will be found in our reports published at the time, and we do not think it necessary to recapitulate the various proposals then brought forward. Suffice it to say that if they are duly carried out, the members will undoubtedly derive largely increased, and more directly personal, benefits from their membership, and the prestige of the Institution to which they belong will be steadily increased, raising their status with it. There is a vast amount of work to be done—the difficulty is not to point out openings for improvement, but to show how they can be filled.

On January 1st the system of admission by examination will probably be introduced in connection with the Associate Membership, and we may expect to see a considerable number of men admitted in anticipation of that date, partly to avoid the unknown terrors of an examination on an unpublished syllabus, and partly to take advantage of the more favourable terms offered to those who join before then. This process has, in fact, been in progress for some time past, and on August 31st the membership stood at the round figure of 6,600—a very satisfactory number, second only to the membership of the Civil Engineers. We hope it will not be long before the 7,000 is attained. The examination question is one of great difficulty, calling for the most careful consideration; we trust that enlightened views will prevail, and that the aim will be to prescribe a real test of culture and technical ability, rather than a mere feat of mental gymnastics or a test of memory. A *viva voce* examination by shrewd and competent observers, possessed of a deep and sympathetic insight into human nature, and free from fads, should form an essential feature of the system; and the fact that engineers in practice always have their reference books and note-books at hand should be recognised by permitting the unrestricted use of such aids in the written examination. Thus cramming will be avoided, and the candidates will be enabled to prove their true worth. The examiner who is always trying to trip up a candidate is the curse of the examination system. No time should be lost in issuing some indication of the ground that will be covered and the standard of general education that will be required of candidates.

A Nice Complication at Buenos Ayres.

After having gradually absorbed nearly all the electricity supply works in Buenos Ayres, including at least one British undertaking, several years ago, the German Transmarine Electricity Co. finds itself at last confronted with the prospect of fresh competition, although rivalry has been threatened on previous occasions. This time it seems that a supply contest will really take place, as the Municipal Council has now granted a light and power supply concession to the Compania Italo-Argentina de Electricidad, to whose application reference was made in this journal two or three months ago. Not only so, but the Government has sanctioned regulations to allow the carrying into effect by the Lacroze Railway and Tramway Co. of the hitherto unexercised clause in its concession which permits that company also to furnish light and power to the public. The German company's concession runs to 1957, and dates from 1907, when the undertaking, which had been in existence in one form or another for a period of 15 years, was consolidated. The 20th clause of the concession provides that the company shall be entitled to claim all facilities which may be granted to other legally sanctioned electricity works in the future. Now the Lacroze concession was issued in 1904, and as a railway company, the undertaking has a perpetual concession based upon national law; it also enjoys exemption from Customs duties for the importation of materials, and has other facilities which the German company does not possess, as the latter must transfer its undertaking under certain sale conditions to the city on the expiration of the licence in 1957. As the decree to give effect to the supply clause in the 1904 concession of the Lacroze Co. was only published on August 6th, 1912, the question arises what date should apply to the concession in so far as the supply of light and power to the public is concerned. The settlement of the problem promises to lead to legal proceedings, the result of which is uncertain. On the one hand, a German correspondent at Buenos Ayres, who apparently represents the Teutonic company, states that the opinion of various lawyers is that the decree of August in the present year has to be regarded as the commencement of the Lacroze concession for supply to the public, and the German company has consequently lodged a claim with the city for the grant of the improved facilities devolving upon the Lacroze Co. under its own concession. On the other hand, the city and the Minister of Public Works assume the standpoint that the general concession of 1904 also applies to the enabling clause of August, 1912, and that, as the former was granted before the German concession, Clause 20 in the latter does not come into application. It is now considered, the correspondent adds, that a legal process can only be avoided if the Government repeals the August decree, but, in this case, a claim for compensation on the part of the Lacroze Co. would probably be made. The idea of suggesting the revocation of the Government decree, under the circumstances, is delightfully frank. It certainly shows the lengths to which the supporters of a foreign monopoly will go in order to endeavour to ward off possible competition. We shall probably next hear of the Standard Oil Co. asking the German Government not to proceed with the attempt to create a State monopoly of the petroleum trade in the Fatherland.

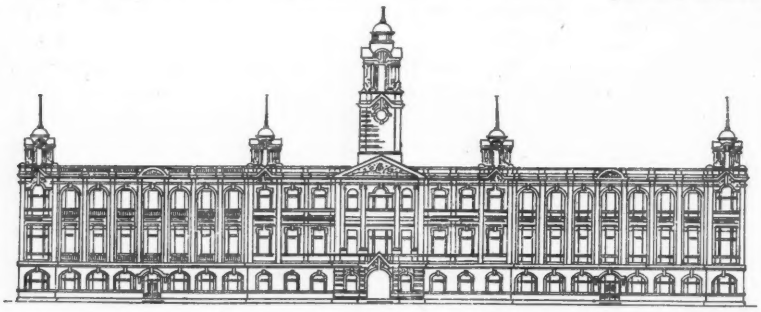
Ionomagnetic Rotation.—A new phenomenon has been observed by Prof. Righi to which he gives the name of ionomagnetic rotation. If a spark from a condenser of considerable capacity is sent horizontally through a gas and two small vertical vanes of mica in the form of a cross are suspended in the middle of the discharge by a fine fibre attached to the centre of the cross, the spark produces no rotation of the cross. If, however, a vertical magnetic field is established in the gas, the cross rotates through a considerable angle if the gas is air, and over a small angle in other gases. Prof. Righi ascribes this rotation to the bending of the paths of the ions or electrons and to the additional protection which the vanes afford each other against impacts from one side rather than from the other in these circumstances. The observed rotations indicate that the effects of the positive ions are in general greater than those of the negative.—*Nature.*

THE UNIVERSITY OF HONG KONG.

An Appeal to British Engineers.

By Prof. C. A. M. Smith, M.Sc.

The eyes of the world are at present fixed upon China. The events of the last few months have been so remarkable and have happened with such acceleration that it is dangerous and difficult to forecast the future. And yet two or three things are certain. (1) China means to become modernised; (2) China contains enormous natural resources; (3) The traders of the world are looking to the Far East for their markets of the future.



Elevation of Hong Kong University.

Concerning Hong Kong.

It was once remarked by an unsympathetic foreign critic that the Britishers had "blundered into the best places on the earth." About 70 years ago the Union Jack was run up, for the first time, on a granite island at the mouth of the Canton River. There were a few Chinese pirates on the island in those days; now there is the city of Victoria. The island is called Hong Kong—so is the port, usually, although its correct name is Victoria.

To-day Hong Kong is, as regards tonnage, the biggest port in the world. There are docks, built by British enterprise, of large dimensions. Hong Kong is the centre of the trade between China and Europe. It is the gateway to the East.

Hong Kong possesses a University. It was opened with simple but appropriate ceremony on March 11th, 1912. Sir Frederick Dealty Lugard, the Governor and Empire builder who inspired the University, opened the magnificent new buildings.

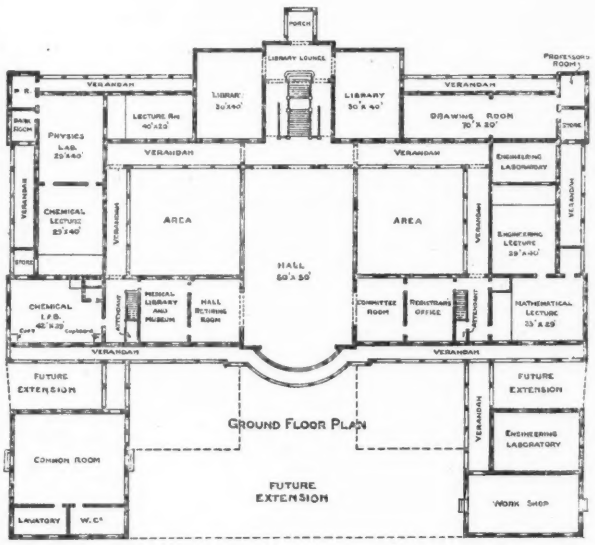
The main building affords laboratories and lecture rooms for the accommodation of 500 undergraduates, and it is planned to be capable of extension. It possesses a magnificent site, is the most conspicuous edifice in the Colony, and is the first glimpse of Hong Kong obtained by the visitor from "home."

The site was given by the Colonial Government—an area of 709,789 sq. ft. It is situated 200 ft. above the sea level overlooking the magnificent harbour. A Parsee resident of the Colony—Sir Hormusjee Mody—gave the buildings. Chinese residents and neighbouring Chinese merchants subscribed over a million dollars to the endowment fund. The English firm, Messrs. Butterfield & Swire, and their allied companies, gave a donation of £40,000. This firm controls the Tai Koo Docks and engineering works. The chair which the writer has the honour to fill is named the Tai Koo Chair of Engineering. The Legislative Council has voted £1,200 a year, annually, as a contribution to the funds of the University. The "Home" Government provides £300 a year for King Edward Scholarships. His Majesty King George V. also caused a letter to be written in which was an expression of his cordial approval, and wishing the University every success.

Objects of the University.

The objects are stated in the preamble to the Ordinance of Incorporation, in the following words:—"The promotion of arts, science, and learning, the provision of higher education, the conferring of degrees, the development and formation of the character of students of all races, nationalities and creeds, and the maintenance of the good understanding with the neighbouring Empire of China." To quote Sir Frederick Lugard:—

> With reference to the first two of these objects, it was stated in various speeches which were made at the time when the scheme was inaugurated, more especially the speeches at the laying of the foundation stone, that the desire of the promoters was to begin with Chairs or Faculties (Medicine and Engineering), which would be of practical utility to China in coping with disease, in developing her resources by railways and by the exploitation of her mineral wealth, and in checking by the light of modern engineering science the terrible floods which almost every year give rise to famines, and carry off millions of starving people. To these is added an Arts Degree to enable those students who desire to adopt an official career to take a good degree, more especially in English, and in the language and literature of their own country and in political and commercial economics. It is, moreover, hoped that the Hong Kong University will be largely instrumental in making King's English the predominant language in the Far East, as pidgin English is already in business and commerce. Such a result would no doubt bring in its train important political and commercial benefits.
>
> For instance, a man trained in the engineering formulæ of other Western nations would not understand British catalogues and engineering particulars, and would draw up his specifications in accordance with the gauges and standards with which he was familiar. The same thing applies to other branches, and it is, of course—so far as mere material and commercial benefits are concerned—of great importance what language is used as the medium for conducting business.
>
> In fact, it may be said that the root idea of the Hong Kong University lay in providing a means of higher education where Chinese boys could remain under the influence of their own parents and guardians in the environment of their own people so that they would be subject to the strong control which Chinese opinion exerts upon young men, instead of being turned adrift in a foreign country where a liberty unknown to young students in the East is allowed to undergraduates, and where they often learn the vices of the West and become denaturalised, and conceive a contempt for the social and political institutions of their own country, and an ill-informed hostility to all constituted authority. These tendencies have led Chinese parents to regard residence at Western Universities with a distrust which has only too often been well founded.



Ground Plan of University.

Engineering a Feature.

It may be advisable to quote a resolution by the Court of Governors:—"It is resolved that the objects of the University are (*inter alia*) to afford a higher education more especially in subjects of practical utility, such as applied science, medicine, &c."

That shows the decided intention of making practical science a feature of the work.

Finally, the writer would quote from a despatch from the Viceroy of Canton to the chief officials of the various Government bureaux under his jurisdiction, requesting them to meet

and discuss means to raise subscriptions in aid of the Hong Kong University Endowment Fund. (Translation.)

He wrote :—

I have perused more than once all the documents which I have received from Hong Kong relating to the proposed scheme. The project appears to have for its principal object the complete training of persons of ability, who will be of real use to us in our industrial and commercial enterprises.

The teaching of applied science, including civil, mechanical and electrical engineering and surveying, meets the present and most urgent need of our country, and the institution of a faculty of medicine is most important, as it works for the improvement of sanitation and the preservation of health.

He then gives the advantages of the scheme :—

1. Up to the present time our country has not a properly organised institution to impart a professional and technical training to our people, though the establishment of such an institution has long become an urgent necessity. The minds of most young men from noble or wealthy families are bent on official ranks and adverse to laborious studies so that they all turn their attention to the study of politics ; whereas ambitious youths of the poorer classes, though willing to go through a course of professional and technical training, are in want of means and a suitable place for their training. Once the Hong Kong University is established, the cost being moderate and the locality close at hand, it is possible for every Chinese youth to join it.

2. Since in China itself there is no such properly organised institution for professional and technical training, we are compelled to send our students thousands of miles away from their native land to Europe or America where official supervision is rendered ineffectual and parental control nugatory. Besides, in youth the character is not yet properly formed, and some of the students may, through idleness or through indulgence to excess in amusements, become lazy in their work, others from want of proper control and restraint drift into immoral and loose habits, and of late our students residing abroad have caused us the greatest anxiety. On the other hand, Hong Kong is so close to us that our young men who went there to study would be almost within sight and hearing of their superiors, parents and elders.

3. In our country we have at present no specialists who have a profound knowledge of technical and scientific subjects, and whatever professors we may require have had to be engaged from abroad, and that merely on their reputation and without actual knowledge of their true qualities. As a rule, scholars who have a good character and great learning are disinclined to accept our invitation and come to a distant land like China, where the mode of living differs so much from that observed in the West. But in the Hong Kong University the professors are to be engaged by the British themselves, who have better and easier means of inquiry and of distinguishing between the properly qualified and the incompetent. They are sure not to permit a responsible position to be occupied by an inferior man, and thus to tarnish the fair name of their Institution. Those professors who have already gained a reputation will be glad to join the staff, Hong Kong being a British Colony, and the social conditions there similar to those to which they have been accustomed. With a properly qualified staff of professors we may look forward with assurance to the successful training of the students.

4. It costs many hundreds of dollars a year to maintain a student in Japan, and many thousands to maintain one in a Western country. In both cases there must be added the very considerable expense of travelling there and back. The expenditure has taxed the resources of the different provinces to the uttermost, and great anxiety is felt as to the future. However, if our students could be sent to Hong Kong instead, a great part of this expenditure would be saved.

Having these four advantages it seems to me that the establishment of a University in Hong Kong has a most important bearing upon the professional and technical training of the people of China. A Parsee gentleman, Mr. Mody, out of fellow-feeling for Asiatics, has generously given a large donation for the erection of the buildings of the University. His munificence deserves every respect and praise. Is it not then our duty, officials and merchants alike, to join our efforts to co-operate and assist ?

The British Engineers.

The University has laboratories for experimental work in heat engines, electrical machinery, hydraulics, strength of materials, &c. At present there is practically no equipment. All the money available is essential for endowment purposes.

The laboratories are admirable showrooms. In four years' time we shall have more than 100 applied science students —we have nearly 50 students in this first year taking the fundamentals of applied science instruction, viz., physics and chemistry, &c. We want equipment badly, and we need it at once.

A Business Deal.

The writer does not appeal for charity. He offers a clear business proposition. Here is your opportunity to advertise in the Chinese market. Will you let it slip ?

Up and down the China coast the traders of other nations are preaching the decadence of British engineering enterprise. They will point to the Hong Kong University with delight to support their arguments if British firms remain inert.

Every piece of machinery presented to us will have a suitable name-plate. We want prime-movers of dimensions not more than 15 B.H.P. We want electrical apparatus such as you will find in any University laboratory. We have at present almost exhausted the generosity of the local Chinese merchants. When I ask them for money for applied science work they reply that the English engineering firms have everything to gain by presenting apparatus and machinery. If we can obtain these gifts from home, we will raise money locally for chairs of mining and metallurgy.

One final word : "*Do it now.*" Please do not delay. He who gives quickly gives twice. We are fighting the battle for British engineers. Surely we may expect some encouragement from them !

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Institution of Electrical Engineers.

It was suggested by a correspondent in your issue of November 1st that the Institution of Electrical Engineers might be of use to the "17s. man," but I would point out that the I.E.E. is useless while it retains as members chief electrical engineers and others who are responsible for the payment of these low salaries, and will not consider a general increase under any circumstances. An instance of this occurred in a municipal undertaking recently, where the chief electrical engineer is a M.I.E.E.

The "Chief" was written to collectively by the whole of the charge engineers of sub-stations of 1,500 to 2,000-KW. capacity, requesting an increase in their salaries ; there was immediately a flutter at headquarters to find the instigator of such an audacious request (who was to be dismissed at the first opportunity, I suppose). Finally, after two months an interview was obtained, at which the "Chief" emphatically stated that—

1. The request for an increase was impudent.
2. He could obtain men to do the same work for £1 per week, as instanced in your advertisement columns.
3. He had put labourers in charge of sub-stations successfully.
4. The best thing that they (the sub-station engineers) could do was to move on to somewhere else.

This is, I believe, not an isolated case, and as "The Institution" is useless to the general body of electrical shift men, the only thing left to do is to form an "Association of Electrical Shift Men," whose object would be to obtain reasonable payment for their services. I should be quite willing to act as hon. secretary of such an association *pro tem.*

Sub-man.

Switchgear Drawing Office Expenses.

With reference to Mr. Dunlop's letter (page 689, current number of the Electrical Review), no one wants a multiplicity of copies of one drawing, but there are two sides, at least, to the problem. Mr. Dunlop has had experience, and will agree with me that even the largest manufacturers leave details to juniors, who too often have not passed the age when they realise that their work is not above criticism, and the department manager, whose work is unquestionably so, does not touch the details referred to.

My reasons for being specific and exacting are based on expensive experience, and I will give instances—one in connection with each of three of the largest manufacturers ; and if Mr Dunlop will show me a better course I will adopt it.

1. Switchboard general arrangement drawing approved, and building designed to suit materials delivered, and after erection was half finished it was discovered that the general arrangement drawing, which stated a scale, was 4 ft. shorter

than details supplied. Result: Crane had to be raised to higher level and roof trusses raised to clear crane's new position.

2. Switchboard ordered to manufacturer's drawing through a contractor, the specification calling for interlocking to render board foolproof. General arrangement showed dimensions overall without details, and 14 reminders and requests bringing no detailed information to the contractor *in time*, he took the risk of guaranteeing that the offer met the specification.

The leading manufacturer then put forward a design embodying extra panels, and the result of adjustment and mutual sacrifice between manufacturer and contractor was that the contractor's profit was nil.

3. Switchboard ordered to general arrangement, one view; dimensioned plan and two elevations of space available accompanied inquiry; the apparatus supplied filled all the space, including the Home Office passageways.

I never consider a tender sufficiently complete unless it includes evidence that the manufacturer has set out every detail to ensure completeness and size in three dimensions to show client and contractor, without unreasonable use of their time, that it is correct in size and complete for the purpose specified.

Another detail that is unsatisfactory is the statement "generally in accord with specification." This when used in a tender leaves a loophole that the aforementioned junior and sometimes higher-placed individuals consider large enough to go through.

C. D. L.

London, E.C., *November 2nd*, 1912.

The Lighting of Bakers' Ovens.

I should be pleased if any of your readers would tell me how to light up the inside of a baker's oven by electricity.

The lighting is at present done by a four-swivel gas bracket, which is swung in and out of the oven door.

I have tried the same method with a carbon-filament lamp with disastrous results, the ordinary fittings wire inside the bracket having its insulation burnt off in a few hours. I have tried asbestos-covered wire on the outside of the bracket; this is not satisfactory, and I find that the solder on the lamp cap is always melting, causing shorts.

I should be pleased to know of any method which will stand rough usage.

Blight.

Fuse Formulæ.

With further reference to my letter in the Electrical Review of October 25th on this question, I should like to add the following remarks.

In the case of a thin wire heated to fusing point by a current of electricity, the interior of it is at a much higher temperature than the surface exposed to the air. In such a case the stream lines of current will take the path of least resistance, and the current will concentrate near the surface. In small diameter wires, where the cooling effect of the surface is great comparatively speaking, this effect ought to be considerable. It does not appear possible, even by means of Fourier-Bessel functions, to solve the problem, although somewhat similar problems have been worked out by Weber (Crelle Bd. 76, 1873). If as an approximation we assume the resistance to resemble that of a thin hollow cylinder and cooling to be proportional to surface, then this gives $c \propto d$, where d is the diameter of the wire. This appears to agree with Schwartz and James's values, viz., tin 1·13, copper 1·19, and W. T. MacCall's result about 0·92 for the index.

As regards thick wires this effect is negligible, since the cooled shell is only a small fraction of the total area; one would therefore expect to find better agreement with the $d^{3/2}$ law.

This appears to be the case judging from result of experiments.

W. H. F. Murdoch.

Millhill, *October 28th*, 1912.

P.S.—Since writing the above letter, I have read with amusement Mr. Chapman's letter in the current Electrical Review. I feel rather sorry for Mr. Chapman, as he seems to fall into the common error of believing that ρ_0 is a constan over the area πa^2, or through the unit volume.

The theory hailing from South Kensington is absolutely a rotten as the famous Navier-Poisson theory proving beyond all doubt that a certain ratio was $\frac{1}{4}$. Dr. Russell in much the same way, by false reasoning, arrives at a value 1·25, and states in his paper "we see that the fusing current varies as the 1·25th power of the radius." Nobody except a South Kensington student could "see" it. Anyway, I am sorry I do not propose to bow down and worship a false theory, when a better one is at hand.

W. H. F. M.

November 3rd, 1912.

Motor-Hiring in Leeds.

By your article on the above, I am led to believe that you have not been fully informed of the actual state of affairs in Leeds.

Electric motors can be had on hire from fully half-a-dozen motor makers and merchants in Leeds on very reasonable terms.

My firm has placed on hire in Leeds over 200 motors during the past 12 months, and I can assure you that in no single case has a man been refused a motor.

By the enclosed lists you will see that our charges and conditions are very reasonable; they cover all sizes up to 100 H.P., and half the payments made for hiring are refunded if the motor is purchased outright.

We are doing a large business in London on the same conditions with great success.

E. Brook.

Huddersfield, *November 2nd*, 1912.

[The list enclosed shows that in the case of motors on hire, 18 sizes are listed ranging from ½ to 100 H.P., with quarterly hire rates of from 7s. 6d. to £10 respectively. On temporary hire, rates are quoted for the first four weeks and per week after.

On hire-purchase, 20 sizes are listed, from ¼ to 100 H.P., with hire-purchase by means of a deposit and 5, 12 or 20 quarterly payments, which, in the case of the 100-H.P. motor, works out at £20 deposit and £35, £19 and £15 respectively.

On simple hire, the firm supplies the motor, starter, switch and fuses, but does no wiring or fixing; while hire-purchase terms entitle the customer to the motor, with switchgear, &c., wired and fixed on the floor and connected to the supply meter if within 20 ft. of the starter.

In both cases Messrs. Brook maintain their goods until purchase is complete.—Eds. E.R.]

Generating Plant for Village Lighting.

In regard to the letters of "Electric Supply" and Mr. E. J. Williams, which I read with interest, and for which I tender those correspondents my thanks, I give a few more particulars concerning my plant.

I realised immediately after sending my former letter that important data had been omitted; one item was the annual output, which is now 5,000 units or so, but is mounting up. The selling price is at present 8d. per unit. Some of your readers will stare at this, but small plants like this are in a category by themselves, and cannot be dealt with like town plants of a hundred times the size.

To begin with, the syndicate running the affair is composed entirely of gentlemen with no electrical knowledge, and it was important to scheme things so that the concern would show some surplus very soon, as they might have lost belief in the thing before it had a fair chance. The next question was, of course, would people pay 8d. per unit? The reply is, "Yes, willingly," in the circumstances. There is no gas (and if there were, it would run to 5s. or 6s. per 1,000 here), and oil lamps are the only competitor. When 8d. per unit was mentioned at first, our prospective customers said, "Oh, it's altogether too dear. Why, it's only 4½d. at W—." So I approached them thus: "If we provide you with a lamp which will run for seven hours for 1d., and a bigger one, which will light your sitting room well, and give you five hours for the same sum, will you be satisfied?"

"Oh, yes." So a few penny-in-the-slot meters were installed, and we got our 8d. a unit easily, attaining the above results with 17-watt and 25-watt tungsten lamps. There are 36 business houses on the route of the mains; out of these, 31 have electric light, two more have passed their orders in for installing it, and another, we believe, is on the point of doing so. This leaves 2 out of 36 not accounted for. We have private houses and places of worship as well. The plant was started in July, 1909, and the supply has been on day and night since without a failure of any kind. Of course, a battery is installed, and the routine is simple. The engine is started about dusk each evening, and runs till 9.45 or 10.0 p.m., the generator during this run supplying all the lights, and also bringing the battery up. Regulation is effected by end cells; I don't know whether a booster is worth while. The plant is practically never run except during the above hours, and then at full load, tending to economy of fuel and labour. The voltage is 100, distribution on the two-wire system by bare wires on wood poles. It may be remarked, as to the voltage, that at the time of starting, metal-filament lamps were not made above 130 volts, and the three-wire system was considered too complicated for its advantages to be utilised. It will be seen that the whole plant is on the very simplest lines, and is smaller than many country house installations. I run the whole affair, driving, keeping plant in order, seeing to meters, in fact taking responsibility for the maintenance of the supply on a contract rate of 3d. (not ·3d.) per unit. This is satisfactory to my employers and to myself; I can work as long or as short as I like—all they want is good results. Let those who gasp at the 3d. remember that a man could run a plant 10 times the size with no more ability and time taken up, making wages cost ·3d. per unit, but if the bigger plant is not needed, the wages must come comparatively heavy—it can't be helped. The running of the plant takes on the average some four hours per day of my time, and house wiring separately paid for, of course, fills up a fair amount of the rest. Then there is usually plenty of work in the way of isolated plants to level things up. I have written at some length, I feel, but I wanted to make clear that there is ground for my conviction that a field exists for such plants. It is significant that people in the locality who were contemptuous critics of the thing at its inception and prophesied its early demise, are now our customers, and would not like to change.

Your correspondents mention a feed heater. This is an obvious and easily installed improvement, and had not been overlooked, but the advent of the crude oil engine had made me hesitate to add to the present plant, hence my former letter.

In brief reply to Mr. E. J. Williams's points (1) and (3) are already answered; (2) is very hard to state just at present; regarding (4), after consideration, we decided that the advantages of meters on the whole justified their cost, particularly when you get a motor meter for a sovereign or so; and ordinary meters are charged at 9d. per quarter rent, slot meters (1d. and 1s.), 1s. per quarter.

A Little Man.

November 4th, 1912.

NOTES ON A FACTORY INSTALLATION.

By E. P. AUSTIN, A.M.I.E.E.

In the application of electric driving to girder and plate working machines there are points of special interest, in addition to the distribution problems that are more or less common to all workshop installations. It is the writer's intention in the following lines to deal with distribution questions that deserve special attention, but more particularly to consider the electromechanical details that belong to the driving of girder working machines.

In a particular case under review, a works engaged in the manufacture of coal-handling and colliery plant generally is supplied from a tramway feeder at 500 volts D.C.

The energy is received in the factory at the point nearest to the tramway system on a master switchboard, constructed throughout of iron, which carries the supply authorities' cut-outs and meter and the consumers' master switches and fuses, all of which are ironclad, with side switch levers and doors interlocked.

The Home Office Regulations allow single-pole control on motors and apparatus connected to tramway circuits and prohibit *single*-pole switches on any earthed conductor, yet it is a wise precaution to use D.P. control throughout; otherwise in the event of a motor being disconnected for any purpose, a careless person may reconnect wrongly and leave a single-pole switch on the earthed conductor only. This question was more fully dealt with by the writer in an article appearing in the Electrical Review of May 26th, 1911.

In line with these considerations, an iron distribution board is installed which carries ironclad switch cartridge-fuse sets that control the individual motor mains. It is situated at a central point for the motor load, and is fed from the main service board by a concentric paper-lead cable drawn into fibre ducts buried in the shop floor. These ducts successfully withstood the floor being levelled with a steam road roller, and the constant storage and handling of 200 tons of girders over the portion of the floor under which they pass.

Each motor is separately fed from this board, and is provided with the usual ironclad main switch and starter at a point most convenient for control at the tools it drives.

Fuses are used only at the distribution board, so that the danger of an incompetent workman renewing fuses is remote,

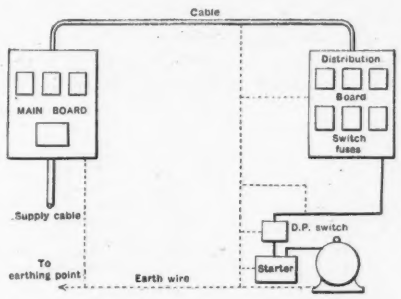


Fig. 1.

since such people have no access to the board. A detailed account of the starting gear appears at a later point in its proper sequence.

All cables are run in steel tubes, of heavy gauge, suitably earthed at a point that is in direct contact with the tramway rails; reference to the diagram in fig. 1 will make more clear the principle that has been described in the foregoing.

An overhead three-motor travelling crane is fed from the service board through a D.P. switch fuse set; but following the lines of tramway practice, the controllers are connected for single-pole control, with the field coils on the negative or unbroken conductor, and reversal is effected on the armature circuit. This system of connection is advisable to prevent the breakdown of the field coils to earth at the instant of opening the controller.

In order to facilitate handling the long girders, &c., the lay-out of the shop is arranged to give full clearance between side walls; and with this end in view, the machines are accommodated in a lean-to structure running the whole length of the shop. An upper flooring in this lean-to forms the bed for some of the motors, which drive by direct oblique belt-drive the individual machines. Thus the working tables of the tools are left clear of obstruction from the shop side, and the belts are used to their best advantage.

The question of group and individual drive is decided by the nature of the work, the load factor of the machines, and the spacing, which last point means abnormal lengths of shafting in proportion to the number of tools driven, if one main drive only is employed.

The bulk of the work is intermittent in character, and consists of shearing, cropping, sawing, punching and drilling, but a broad division may be drawn between the machines

running fairly continuously and those used only at intervals during the day.

In the first class are the cold saws and the drills. One group is made up of two cold saws and one cropping machine, all three driven from one shaft. Results of load tests on this group are given below, from which it will be seen that the group method is the best in this case, in view of the conditions that two out of these machines are generally working, and the shafting loss is small :—

Motor.	*Load in H.P. input.*	
18 B.H.P. shunt interpole	shaft and loose pulleys	4
	and one saw	5·37
	and two saws	6·7
	and two saws and cropper	18·0

The average time of sawing is 20 min. for a 6-in. girder, but the speed may be increased to twice this value for cuts of small area. Diameter of saw is 2 ft. 4 in., thickness $\frac{1}{4}$ in., R.P.M. 8, giving a peripheral speed of 58 ft. per min.

The length of the above-mentioned shaft is 30 ft., with five bearings and five pulleys of varying sizes and weights. The initial starting current is 22 amps., with an average of 7 amps. on all succeeding notches.

The question of type of motor is one that needs careful consideration. The girder cropper possesses a heavy fly-wheel, and would commonly be driven by a heavily-compounded motor, but since other machines are driven from the same shaft, the big drop in speed consequent on using the cropper would decrease the output of its neighbours. Therefore, an approximately constant-speed machine of big overload capacity for short duration is used. A more detailed account of fly-wheel effect in special cases is given later.

The remaining group-drive consists of a line of three radial drills with travelling drilling heads for high-speed work, all driven by bevel gear from a main shaft on the ground level, and arranged at right angles to the length of

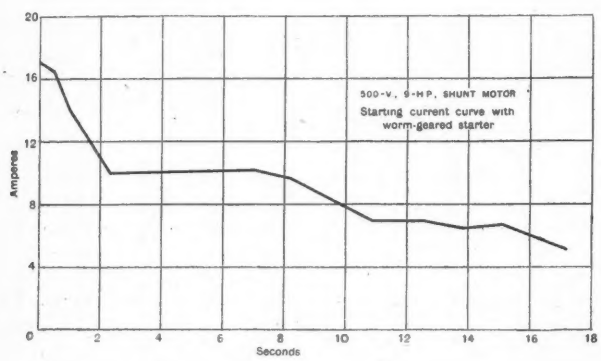


Fig. 2.

the shop. All these can be used on the same girder or perform individual work, as desired. The main shaft is belt-driven by an adjustable-speed interpole compound motor giving a 500 to 1,000 R.P.M. variation on field regulation. Its rating is 13 to 15 H.P. at 500 volts, depending on speed. No other speed adjustment is used on the drills, since this wide range meets all requirements. The starter and field regulator are interlocked, so that the motor can only be started on its lowest speed, *i.e.*, strongest field. The power required of this motor is as follows :—

Initial starting current on shaft and drills unloaded	18 amps. × 500 volts.	
Running current thus, at 500 R.P.M. ...	4	„ „
„ „ „ at 750 „ ...	7½	„ „
„ „ two ⅝-drills, at 750 „ on motor	15	„ „

The remaining machines in the shop have their individual motors, driving them from above, as previously described, by means of belts direct on to the fly-wheels, all striking gear being dispensed with. On this account special precautions are necessary in the choice of starting gear. The requirements to be fulfilled may be briefly summarised as follows: Simplicity of apparatus requiring minimum attention, combined with robust construction, complete enclosure of arm and contacts (but ventilation of resistance elements is desirable) and a distinct and certain indication of the position of the starter arm. It must not be possible to start up so quickly that the accelerating current is likely to burn out the starter or damage the motor. The fly-wheels possess considerable inertia, and must therefore be accelerated slowly. To meet these conditions the writer has found that a worm-geared handle on the starter answers well, and the curve given in fig. 2 illustrates the behaviour of such apparatus in the hands of an ordinary workman.

The process of determining the correct size of motor for any particular fly-wheel machine is fairly complicated, and it is necessary to possess full details of the fly-wheel, time of each operation, time between the completion of one operation and the commencement of the next, power required for each operation, power required to accelerate fly-wheel, and power required to run the fly-wheel light, *i.e.*, friction loss, and maximum load on motor.

Now, the energy stored in a fly-wheel is given by the formula—

$$E = \tfrac{1}{2} M V^2, \qquad (1)$$

where E = energy stored; M = mass; W = weight in lb.; V = velocity of the *centre* of gyration in feet per second; and

$$\text{H.P.-seconds} = \frac{W \times V^2}{550 \times 32{\cdot}2 \times 2}. \qquad (2)$$

Since the energy delivered by a fly-wheel depends on the fall in speed during a complete operation, and the motor must restore a corresponding amount to the fly-wheel during the intervals in addition to supplying the friction losses, we can by using suitable instruments arrive at the correct size of motor and necessary characteristics to meet a particular combination of conditions.

The energy delivered by a fly-wheel during a certain fall of speed may be calculated thus :—

$$\text{H.P.-sec.} = \frac{W (V_1^2 - V_2^2)}{550 \times 32{\cdot}2 \times 2}, \qquad (3)$$

where W = weight in lb.; V_1 initial velocity in feet per second of centre of gyration of fly-wheel; V_2 final velocity in feet per second of centre of gyration of fly-wheel.

Formulæ frequently used for calculating the torque and H.P. are as follows :—

$$\text{H.P.} = \frac{T \times \pi \times (N_1 + N_2)}{33{,}000}, \qquad (4)$$

where T = lb. at 1 ft. radius; N_1 = initial R.P.M.; N_2 = final R.P.M.; K is a constant depending on design of fly-wheel, and

$$T = \frac{\cdot 0032\text{?} \, W K^2 (N_1 - N_2)}{t \text{ (in seconds)}}. \qquad (5)$$

To determine approximately a suitable motor for a given fly-wheel and load, the following method may be used. The average power required for friction is obtained thus: run the fly-wheel up to speed with working parts in gear, observe speed on a tachometer, disconnect from source of power and observe the time taken to come to rest; knowing the constant K, and the R.P.S. = S—

$$V^2 = 2 \pi K^2 S^2.$$

Formula (1) thus becomes—

$$E = \tfrac{1}{2} M \times (2 \pi \times K^2 \times S^2),$$

and the total energy expended on friction is obtained by means of formula (2).

To obtain the useful load proceed as before, but allow the machine to perform a given number of complete work operations over a measured interval of time; the results obtained, minus the friction load, give the useful load. The values of the total and useful torque may be obtained from formulæ 4 and 5.

This method gives sufficiently good results for moderate powers, and enables the engineer to decide on the size of the motor and the approximately correct speed characteristics suitable for the work—in other words, the compounding required, or "slip" necessary as the case may be, between friction load and working load. The temperature rise of a motor in such cases is, of course, proportional to the R.M.S. values of the load, and not the average values. For a complete discourse on fly-wheel and motor capacities the reader is referred to Mr. Ablett's paper in the I.E.E. *Journal*, Vol. 48.

The cropping machine is one that requires some little care in adopting a suitable motor to drive it. The process of cutting a girder, for instance, by this means, is carried out in a series of "crops" at a frequency of about 3·2 per sec. Obviously the function of the fly-wheel is two-fold, namely, to take up a proportion of the useful load during the complete operation, and to supply the energy for the blow delivered on each individual crop. A comparatively long interval between successive operations is taken up in changing the girder. In order to keep up the output, it is quite allowable to use a shunt motor that will take 50 per cent. overload momentarily, the resulting armature drop allowing the fly-wheel to do a proportion of the work.

The following observations were made on a machine driven by a 9-H.P. shunt interpole motor, cutting a 10-in. girder :—

Initial start on fly-wheel and gears ...	24 amps. at 500 volts		
Starting current varied between	18-14	„	„
No load (friction loss)...	5	„	„
Load current rose to	22	„	„ in 6 sec.
Time to cut girder	15 sec.		
Time of starting	35 sec.		

The peak load of 22 amperes is reached twice, at points where the blade encounters the web and flange simultaneously. The full-load current of the motor is 16 amperes, and in this particular test the overload was 37 per cent. approximately.

Another example of individual drive is the shearing machine driven by a compound 10-H.P. motor. The machine possesses two fly-wheels, and performs three operations at one revolution of the tool operating shaft. The observations were as follows :—

Initial starting current ...	25 amps. at 500 volts
Average	10 amps.
Time of start	19 sec.
Friction load	2·5 amps.
Total load current	6 amps.

In the case of the cropping machine, a smaller fly-wheel could be used, but the advantage is scarcely worth the expense of changing the wheel.

CHINA—AND BRITISH ENGINEERING.

By ERNEST T. WILLIAMS.

Only a year ago I was in Peking, and on every hand there was evidence of Manchu dominion. I was to have continued my journey by the weekly fast train to Hankow *en route* for Shanghai, but there were rumours of trouble in the former place, and, as my time was limited, I perforce had to travel to Shanghai by sea, whilst my friend caught the train—the last that got through from Peking to Hankow for weeks—and saw something of the revolutionary outbreak and fighting there; we met later at Shanghai. Thousands of refugees were coming down the river; each boat was packed with passengers. I saw several banks with closed doors, and hundreds of Chinese crowding round in hope of their opening for business again. Foreign sympathy was generally with the revolutionists, but it was thought that they had little chance of success. Was it the beginning of the break up of China, the oldest Empire in the world? Those who know China best felt the least inclined to give decided opinions; all seemed to think that it would take years before the country was settled again and credit firmly established.

A year has passed since then, and I might quote here extracts from a leading article in the *Hong Kong Daily Press*, showing how marvellous a change of attitude on this subject has come over those responsible for conducting a well-established daily; their observations reflect the enlightened opinion of those who are in regular contact with China and the Chinese.

It would be foolish to overlook that the new Republic is still in deep water, and many difficulties will have to be faced and conquered in coming years before the complete confidence in China of the business world is gained, but it would be none the less foolish to overlook or belittle the remarkable progress that has already taken place, and the spirit of amity and co-operation which is prevailing in the councils of the country's real rulers.

The appointment of Dr. Morrison as Political Adviser, and of Sir Francis Piggot as Legal Adviser, to the Chinese Government, also the rumoured appointment of an Adviser on Railways, are marked indications, to those who know something of China, of the real beginning of a period of advance and reform, the more so when it is remembered what momentous questions the Government has had to deal with during the last few months.

Now what does all the wonderful new policy of progress and development mean? Again it is most difficult to prophesy, but certain clear lines stand out of which the wise will take careful note, for those who take advantage of the present golden opportunity will undoubtedly reap a golden reward. These points may be summarised as follows :—

1. Here we have a vast country, with enormous mineral wealth, which has hardly been touched.

2. There is a population whose numbers are unknown, but are estimated to exceed 400,000,000.

3. The country has an old civilisation, and the people are intelligent, sober and industrious, and amenable to authority and discipline.

4. The people are wakening up to the realisation that the West has much to teach them, and they are now as anxious to learn as previously they were ready to despise and ignore foreign knowledge.

5. The leading Chinese are alive to the potentialities of this great Republic and to the possibility of its taking its rightful position in the family of nations.

6. Remembering the unique progress made by the Japanese in a short period, it is not unreasonable to expect a similar progress in China during the next few decades.

7. The leaders of the people realise that they cannot undertake the rapid development of the country themselves, and that foreign aid and capital, and the giving of concessions to foreigners, are essential.

8. The country most urgently requires :—Good roads, extensive railways, afforestation, irrigation, mining schemes, electric light and power, telegraph and telephones, tramways, manufacturing machinery, &c., to mention only those items of interest to engineers.

9. It can now almost safely be predicted that the "boom" in trade, long expected by those dealing with China, may take place within a few years. If the country is really opened out, this boom is likely to be even greater than is anticipated.

10. With the exception of the depletion of the forests, we have, from the standpoint of development, almost as virgin and wealthy a country as North America was a century ago, but with this great difference—that whereas the one had practically no population, and many tracts of land dangerous and unexplored, the other has a great population to supply cheap and intelligent labour to work the country's resources, and the Government are ready to protect foreign life and capital.

Then there will be the increased needs of these millions to be supplied as soon as they adopt a higher standard of living, which will inevitably follow on the opening up of the country.

There are other dominant factors in the situation which could be added to the above summary, but enough will have been said to show that we are on the eve of big things in the old Celestial Empire. The possibilities of China have long been realised, hence the proposals for the "Partition of China," "Spheres of Influence," &c., of which one often hears. It is also the realisation of these possibilities which has made the great nations walk warily, and which has had the happy consummation of their working together to avoid the dangers which must arise from other than mutual and concerted action.

But if China opens up as is expected, there will be enough for all who take the trouble to obtain their share. Though such a boom would increase trade all over the world, it can be taken as a *sine quâ non* that the greatest and most direct result will accrue only to those who are going to study the problem and deal with it in a comprehensive manner.

With the passing of the Manchu *régime*, the great obstacle

to the country's development has been removed, and with it we hope the deplorable system of "squeeze," a half-recognised system of dishonesty which sapped at the very roots of sound finance so essential to real progress.

In any case there is a spirit abroad, with which all honourable people will be in agreement, that China's resources shall be exploited for the advantage of the Chinese, and the participation of Chinese capital and straight dealing are essential to continued success.

Now, *is British engineering going to rise to the occasion?* The prospect is big—very big—far too large to be dealt with extensively by individual firms. It would appear that there are two ways of dealing with the problem. The first of these is by the formation of a company, not necessarily with large capital, but with powerful financial backing, to seek out and obtain concessions and float these on the market.

The second way would be the amalgamation of several large firms—so far as their interests in China are concerned—who would obtain the concessions direct from the Chinese Government, or indirectly from the holders, and develop them into working concerns. China is such a vast country, and business transactions in the past have been so slow, that success on any large scale necessarily implies considerable initial expense and possible outlay before an adequate return might be expected; this is one reason why an amalgamation of interests is so desirable. Then, almost certainly, it will be necessary partly to finance any scheme. The need for united action has been previously insisted on in the writer's article on "Extending British Engineering Abroad," published in the Electrical Review on November 25th, 1910, page 851, reference to which is suggested to those interested.

The agents sent to China should be the best men obtainable, of undoubted integrity, capable as engineers, with sound business instincts, and able to consider problems from China's standpoint. They should be very well paid to compensate for the many disadvantages of their offices, and must not be treated parsimoniously as regards either staff or expenses. They must receive ready and sympathetic support from their principals.

Finally, *is British engineering*, and the electrical and allied branches in particular, *going to grasp the opportunity—an opportunity which, once lost, may never come again?*

THE NATIONAL INSURANCE ACT, 1911.

The Stamping of Insurance Cards and Books.

By JOS. J. H. STANSFIELD, F.C.I.S.

A common ground of objection to the collection of contributions payable under the National Insurance Act by means of deductions from wages, was that this method would entail upon employers additional expense in consequence of the records necessary, and the necessity to take charge of, and stamp from time to time, the cards required under the Health, and the books necessary under the Unemployment, parts of the Act.

In order to meet these difficulties so far as is possible under the provisions of the Act, the National Health Commissioners and the Board of Trade have issued circulars giving methods by which the requirements of the Act may be complied with with greater ease and less expense than would otherwise be the case.

The methods so far approved are three in number: (1) stamping during the week after payment of wages, (2) quarterly stamping, and (3) arrangements with Labour Exchanges.

In manufactories and workshops where there are a considerable number of employés, no time must be lost in the collection of time-sheets and the making up of wages sheets or wages books, if all is to be ready for the payment of wages at the proper time, and the extra time taken up in consequence of the entries necessary under the Act, and the stamping of cards and books before such payment, may in some cases be found to be that last straw which brings the camel to its knees.

To meet this difficulty employers have in some cases lengthened the period between the end of the working week and the payment of wages, but this may not in all cases be feasible, and to meet such cases the Health Commissioners have issued Circular No. 127 A.G.D., entitled "Special arrangements for stamping during week after payment of wages," stating that the Commissioners are prepared to consider applications from employers for permission to adopt the arrangement indicated by the title of the Circular.

This arrangement only applies to Health cards, and cannot be made for less than 100 persons, and it is only applicable where employés have agreed to deposit their cards with their employers during the period of currency, though it may apply to the whole or a part only of such employés.

Careful records must be kept readily showing, week by week, the contributions payable, and the reason for non-payment should no contributions be payable. If it be found on inspection that the number of employés whose cards are not stamped before payment is greater than the number in respect of whom the arrangement is made, the permission of the Commissioners to the arrangement will be at once withdrawn.

Employers will be required to deposit an amount sufficient to cover the contributions for one week or other period for which contributions are payable, the deposit remaining with the Commissioners so long as the arrangement continues. The initial deposit should be forwarded not later than four days before the first pay-day under the arrangement.

The circular sets out conditions applicable where there may be an increase in the number of employés to which it is desired to apply the arrangement, the stamping of cards, and the refund of deposits.

Any employers in England desiring to adopt the arrangement, should obtain a form of application (127 b.A.G.D.) from the Accountant and Comptroller-General, National Health Insurance Commission (England), 29, Queen Anne's Gate, London, S.W., marking the envelope "Circular 127." Information as to similar facilities granted by the Scottish, Irish and Welsh Commissioners can be obtained on application to the respective Commissioners.*

In some cases, employers may desire to stamp their cards quarterly, and in such cases the conditions of Circular 105, A.G.D. apply in respect of English employers.

The general arrangements as to quarterly stamping are very similar, *mutatis mutandis*, to those applicable to stamping after payment of wages, the form of application being numbered 106 A.G.D.

The methods by which deposits may be made are five in number (1) a deposit sufficient in amount to cover the whole of the contributions payable during the quarter in respect of the maximum number of employés to whom the arrangement applies; (2) an instalment equal to one-thirteenth of the amount required under method (1) payable four days before each pay-day; (3) a deposit paid four days before the first pay-day in each quarter thereafter, remitting each week a cheque covering the amount actually payable in the previous week; (4) a similar arrangement to (2), applicable where wages are paid fortnightly or monthly: and (5) an arrangement similar to (3), also where wages are paid fortnightly or monthly.

Special high-value stamps are issued in connection with quarterly stamping for 13, 10 or 2 weekly contributions at the various rates payable under the Act.

Under the provisions of the circular, where the wages of any employé are paid before the ordinary pay-day, or where an employé terminates his employment, or wishes to have his card stamped to date, the cards must be stamped in the ordinary way with stamps obtained from a post office.

A careful consideration of the two circulars leads to the conclusion that, on the whole, the quarterly arrangement is the better, particularly if method 3 or 5, whichever may be applicable, be adopted, as no interest or discount can be allowed on deposits.

* The addresses for Scotland are 42, Frederick Street, Edinburgh; for Ireland, Pembroke House, Upper Mount Street, Dublin; and for Wales, City Hall, Cardiff.

Communications in respect of this arrangement should be made to the Accountant and Comptroller-General at the address as before stated, marking the communications "quarterly stamping."

The Insurance Act is divided into three parts; but, although Part 2 applies to unemployment insurance, Sec. 99 of the Act enables the Board of Trade to make arrangements with employers in respect of both the health and unemployment parts of the Act where workmen are engaged through a Labour Exchange, and where any such arrangement is made, all the periods of employment during which a workman is employed by one or more employers may be treated for the purposes of the unemployment part of the Act as a continuous period of employment under one employer, a provision which is exceedingly valuable, as will shortly be explained.

A circular has been issued by the Board of Trade stating the conditions upon which Labour Exchanges will undertake the custody, stamping, distribution and exchange of Health Insurance Cards and Unemployment Books, but this arrangement is, as a general rule, only possible in areas served by Labour Exchanges in which the necessary accommodation is available, and can only be made in respect of workmen who are employed at the time the arrangement is entered into, and such additions to the staff as are subsequently engaged through Labour Exchanges.

Engagement through a Labour Exchange necessitates notification of the vacancy to the Exchange when any workman sent from the Exchange may be engaged, or the employer may send down to the Exchange for registration any workman whom he desires to engage to fill the vacancy. This provision will, no doubt, do much to increase the number of appointments filled through the Exchanges.

Deposits to cover stamps for the whole of the workmen for not less than two weeks must be made, and a three months' agreement at least be entered into, terminable by either party by one month's notice.

No charge is made for work done in connection with unemployment books, but a minimum payment of £1 for each four calendar weeks, and 2s. per 100 workmen after the first 1,000, must be made in respect of Health Insurance. For casual engagements a minimum of 25 per cent. extra will be made, the actual amount depending upon the work necessary. A group of employers may combine to make up 1,000.

In addition to being relieved of the custody and stamping of the cards and books, groups of casual employés may have their contributions under both parts of the Act pooled, and so pay only in proportion to the actual labour of a week, instead of paying the full rate of contributions which would be payable by an employer who engaged a workman for the first day of the week for which he was employed. This means a big saving in respect of employés such as dock labourers; and arrangements of this kind have already been made in several towns. It also means fairly continuous employment for workmen, though it will probably have the effect of restricting the work to a smaller number.

Under some of the decisions of the Umpire appointed under the unemployment part of the Act, it not infrequently happens that workmen may be employed for a whole week but be only liable for insurance for a part of the week. In such cases, the number of days for which contributions are liable are added together by the Exchanges and divided by six, the result being the number of weeks for which contributions are payable by the employer. To take a case: If 60 workmen are engaged for an average of three days only in one week, the employers' share of the contributions would be 60 contributions at 2½d. each if stamped in the ordinary way, but if the Labour Exchange deals with the stamping, only half that amount would be payable.

A similar advantage may be obtained in mechanical engineering and other establishments where two shifts are worked, the second shift being for five nights only per week. The employer would, if dealing with his own stamping, pay 2½d. per week per employé as his share of the contributions, whilst the Labour Exchanges would call for only five contributions for every six workmen.

Under Sec. 94 of the Act an employer may within one month after the end of any period of 12 months fixed by the Board of Trade, apply for a refund of one-third of the contributions paid on his own behalf in respect of employés who have been engaged for the whole year, and for whom not less than 45 contributions have been paid. Arrangements through Labour Exchanges will facilitate the collection of these refunds.

In the first instance books will be stamped for the full amount of the contributions payable by both the employer and the employé, but the workman may ask for his own contributions to be pooled, and any over-deductions that may be made through employment for less than six days, or with more than one employer, may be refunded. In order to facilitate these repayments, special stamps have been issued upon which the figures 1 to 6, representing the number of days worked per week, appear in the space where the figure 5 appears on the ordinary stamp, each of these figures being reckoned as one-sixth of 2½d., for the purpose of arriving at the amount of the contributions payable by the workmen.

Where employers wish to deal with their own Unemployment Insurance Books, arrangements may be made with the Board of Trade for stamping at extended intervals, these arrangements being somewhat similar to those made by the Health Commissioners for quarterly payments, stamps being issued in due course covering the whole quarter's contributions.

Applications for particulars of the arrangements made by the Board of Trade should be made to the Board of Trade, Central Office for Labour Exchanges and Unemployment Insurance, Queen Anne's Chambers, London, S.W.

BUSINESS NOTES.

Consular Notes.—Italy.—The British Consul at Milan, in a recent report, states that the diminution in the imports of electrical machines, &c., which was noticed in preceding years, continued in 1911, and became more marked. It is the same with detached parts and working machines forming part of electrical motors. In 1911 Italy imported, on the whole, 75,000 quintals, against 83,300 quintals in 1910, and 90,700 quintals in 1909. Germany sent 2,000 quintals less, and Switzerland 8,000 quintals less, but other countries benefited slightly. On the other hand, Italy has been producing more electrical machinery; 85,000 quintals are reported as having been produced in 1911, against 77,000 quintals in 1910, and as the quantity produced in 1909 was 67,000 quintals, it must be concluded that the demand in Italy is practically stationary, and the output compensated for the decrease in imports. Three years ago the home industry supplied 42·5 per cent. of the total requirements, in 1910 it supplied 47·5 per cent., and in 1911 53 per cent. The total quantity has risen gradually from 158,000 to 160,000 quintals. Imports from Germany meanwhile descended from 35 to 33·8 per cent., and then to 31·5 per cent. A confirmation of the rapid extension of installations for electric lighting is found in the returns of imports of electric lamps of all kinds. While arc lamps have risen again to 1,000 quintals, incandescent lamps have risen from 6,838,000 to 7,647,000, an increase of nearly 1,000,000 lamps, without taking into account home manufacture, which is reckoned to be close upon 2,000,000 lamps, and is expected to reach 6,000,000 or 7,000,000 lamps. In the matter of accessory apparatus for electric installations, Germany sold to Italy 9,503 quintals in 1911, against 10,000 quintals in 1910. Here, again, it would seem that Italian industry is developing. As regards electrical measuring apparatus, indicators, recorders and meters, Germany sold Italy 2,211 quintals in 1911, against 2,503 quintals in 1910, thus indicating a revival of national industry.

Russia.—The American Consul at Batoum, in a recent report, points out that there is a big market in Baku for oil and gas engines. These engines have been used in the Baku oil-fields for several years, and their use is rapidly extending. It is estimated that 2,000 engines are now in use in Baku, and they are being sold at the rate of 400 or 500 a year. One firm claims to have sold 135, valued at about £100,000, during the past year, and altogether a total of about 700 valued at about £400,000 during the past few years. A Baku firm has just sold for the use of the electric tramway at Tiflis an oil engine of 1,750 H.P., of Belgian manufacture, for which a price of about £25,000 was received. The engines are used both for baling the oil wells and for running compressors. The popular sizes range from 35 H.P. to 150 H.P. for gas engines, and from 24 H.P. to 66 H.P. for oil engines. Oil and gas are rapidly replacing steam throughout the oilfields, and large numbers of steam engines and boilers are being dismantled. Motors for crude oil and gas are the types in demand. Some of the oil wells produce gas, and whenever possible this gas is used for water power and furnishes a fuel without cost to the operator. When the wells of a property produce insufficient the operator uses his own crude oil for fuel. At present crude oil has a market value of 35 copecks per pood. The majority of the wells are without gas, but gas is produced in sufficient quantities to create a big demand for gas engines. By using their own gas or oil the operators of wells are thought to have effected

a sufficient economy over steam to pay within two years the original cost of an engine. Gas engines are used principally in the Bibi Eibat fields, where the wells produce gas in sufficient quantities for the purpose. The Balakhani wells have little gas, and crude oil motors only are used in this district. About 80 per cent. of the motors used in the Baku oil fields are of British manufacture, and these sales are confined principally to four makes. From the beginning the gas and oil engines of English manufacture have enjoyed a practical monopoly. Belgian, Swedish and German engines are coming into use, but do not compare in popularity with those manufactured in England. Engines of Russian manufacture are now being put on the market, but experts consider them inferior to those of British and European make. The past three years has witnessed the greatest development in the use of such engines at Baku. Despite the large number already sold at Baku, a larger future market remains. Many firms have been slow to discard their expensive steam plants, but are now doing so. Nobel Bros., for instance, one of the largest oil producers in the region, have just purchased their first oil engine. For their various wells Nobel Bros. could use about 600 engines should they decide to substitute gas and oil motors for their steam equipment. The present tendency is to use motors of high horse-power, and those of 40 to 60 H.P. are supplanting the 20 to 30-H.P. motors formerly used. As the oil wells become exhausted they are driven deeper and higher-powered engines are required. The price of the motor is of little importance to the operator so long as he obtains an engine that will accomplish satisfactorily the work required of it.

It is noted that some of the European manufacturers sending engines to Baku are having some of the heavier parts, such as fly-wheels, made in Russia, thus effecting a considerable economy in freight and duty charges. The duty on these engines coming into Russia is 3.20 roubles per pood.

Terms of payment are usually one-third of the price paid with the order as "hand-money," and the rest from 6 to 18 months. For cash on delivery there is a discount of 5 per cent.

The use of oil and gas engines in the regions around the Caspian Sea is not confined to the oil-producing fields. Engines using crude oil are in demand for all purposes. Crude oil is cheap and easily procurable throughout the countries bordering the Caspian. The oil, cotton and agricultural districts of the trans-Caspia are supplied from Baku, as are also the cotton and agricultural districts of northern Persia and the trans-Caucasus. The demand for gas engines is limited to those wells actually producing sufficient gas for fuel purposes. The crude oil engine finds a market wherever power is required, and in the countries bordering the Caspian Sea it is used for driving cotton and agricultural machinery, mills, and irrigation plants.

About 400 ships of 500 to 5,000 tons are in service on the Caspian Sea. These boats use crude oil under the boilers, but efforts are being made to adapt crude-oil engines. One boat of 5,000 tons has been equipped with a Diesel engine. The captain reports that there has been a big saving of fuel, but the initial price of the engine is so high that the question of actual economy is still open.

France.—The British Consul at Paris, in a recent report on the economic development of France, points out that the census of 1906, gave figures of the development from 1901 to that year for different classes of motive-power. The figures of last year's census have not yet been published. A grand total of 12,150,000 H.P. was obtained for the whole water-power in France at the beginning of 1906. The results of the 1906 census showed a great increase during the previous five years, especially in the employment of water power. It is expected that the census of last year will show a far higher increase of motive power in all directions.

The subject of the electrification of parts of the French railways has recently been much before the public. As long ago as 1899 proposals of this kind were brought forward for short suburban lines. They were soon afterwards carried out, and further short sections have been electrified in different directions. A further extension is about to take place on the State railways, formerly the Western line, and work has already been begun without waiting for the decree which will officially sanction it. At present, however, it appears to be the intention of the Government only to electrify certain local lines.

Formosa.—The British Consul at Formosa reports that the Government electric power station at Koresho was completed in the summer for the supply of electricity to Taichu, the chief city in the centre of the Island, and Shoka. A dynamo of 500 H.P. is sufficient for lighting purposes, but there are two of these. Water is led from the Daian River along a canal to a place where a fall of 130 ft. is obtained to the river bed, and here the turbine is placed, the flow being 300 cb. ft. per second; a flow of 100 cb. ft. suffices to obtain electricity of 1,000 H.P. from the dynamos, and the surplus flow of 200 cb. ft. per second is sent for irrigation. There is, therefore, a large reserve of motive force should occasion arise for the supply of electric power for manufacturing purposes in the central district of Formosa.

Spain.—The American Consul at Barcelona, in a recent report, states that in 1910 there were 1,696 electric plants in the Spanish Peninsula and the Balearic and Canary Islands, with 2,685 generators and 277,907 H.P. Barcelona heads the list in the number and size of plants, followed by Madrid. There were 1,030 installations for commercial purposes, with a capacity of 127,103 KW. For public lighting throughout the Peninsula, 164,136 incandescent and 2,142 arc lamps were used. There were 1,737,341 incandescent and 9,720 arc lamps in private use. The motors numbered 4,745, of a total of 30,012 H.P. The use of electricity is rapidly increasing for all purposes. A number of electric railways are projected in various parts of the country, the centre of the movement being in the Catalonia district, where several strong companies are constructing and operating electric railways and power plants.

The British Consul at Malaga reports that the local telephone system was extended in 1911 by the establishment of an exchange whereby Malaga is now connected with a large number of centres within the kingdom, including Madrid. The long-distance service is to be further extended so as to give within a few months direct communication with about 53 important towns, the project including places as far distant as Barcelona and San Sebastian. In connection with the above service, a new system has also been inaugurated for the transmission of telephone messages. A 15-word message destined for any place outside the province may be sent for about 9d., or to any place within the province for about 4½d. These messages are received on forms similar to these in use for telegrams, but the service is generally far more rapid.

The British Vice-Consul at Almeria reports that during the past summer the Inter-Urban Co. of Telephones, whose central station is at No. 1, Calle Alcala, Madrid, extended their connection to Almeria. Up to the present it has worked well, messages having been promptly transmitted, and conversations carried on with Madrid and other cities and towns with ease and profit.

Bavaria.—The British Consul at Munich, in a recent report, states that unexampled progress has been made during the past few years in the development of the electrical industry. As regards turnover and profits of the large electrical concerns, each new financial year puts the preceding one into the shade. Nevertheless, the question is constantly cropping up whether the world's market is not sufficiently supplied for a long period with the products and producing power of this industry, and whether the available funds at disposal will not be exhausted. Considering, however, that the large companies are constantly obliged to extend their works to be able to cope with fresh orders, and that the electrical industry has problems before it, the solution of which will employ engineers and technicians for a long time to come, such doubts may apparently be waived. In the near future progress in the electrification of railways is to be expected. This would facilitate the supply of cheap electric current to industry, agriculture and handicraft, especially in such cases where the electrification of railways can be furthered by utilisation of water power. The current could be also carried to such places where up to now it is impossible to take advantage of this power. The use of electric motors and dynamos is gaining ground in all branches, and hence the demand for these in all sizes has up to now increased from year to year. The latest branches of the electro-technical industry, such as obtaining nitrogen from the air, improvements in water supply through erecting ozone works, and wireless telegraphy are sure to mean more work. The prospects opened out to the electrical industry in connection with power generating stations, are no less important. Adequate work is on hand, and more is expected owing to the draining machines and ventilating apparatus, &c., required in mines, the installation of larger gas engines and generating plant in the iron industry, and the increasing use of polyphase electric motors in the textile industries. Machine, turbine, and apparatus works of electric companies are using electricity on a large scale. The departments making electrical and mechanical block-houses, switches, transformers, and the outfit of railway signal-boxes are especially busy. The same applies to turbine works. The supply of the most important centres of Bavaria with electricity for power and lighting purposes by central stations has been considerably advanced in 1911. Not only the interest of the larger towns, but also the small parishes, agriculture as well as industry, are being taken into consideration. The current is at present to be generated by motor power. In due course, however, and when all arrangements have been carried through, it is intended to have these central stations supplied by electricity generated by water power in the Alpine district of the country. In October, 1911, the following companies were floated:—(1) Pfalzwerke (the Palatinate of Bavaria Works). For the first building section the following has been agreed upon as to the participation of share capital:—Municipalities and parishes, 30·6 per cent.; the District Council, 46·9 per cent.; consequently public corporations, 77·5 per cent.; the Rheinische Schuckert-Gesellschaft (Rhenish Schuckert Co.), participate with 22·5 per cent. of the capital, and act as building contractors. (2) Frankenwerke (Franconian Works). The city of Nuremberg subscribed 51 per cent., the sister town, Fürth, 23 per cent. of the share capital; therefore, the municipalities together 74 per cent., the building contractors, Schuckert & Co., 26 per cent. Towards the end of November, 1911, a central power and lighting station—on a similar basis to that at Nuremberg—was agreed upon at Munich. In conjunction with several bankers it was floated by the corporation of Munich. The capital of the company with limited liability is to be £450,000, and the firm styled Leitzachwerke A.G. The central power stations are to be produce electric current and to supply it to the shareholders (for instance, the Franconia Works will supply the cities of Nuremberg and Fürth and the Schuckert Co.) cheaper than they have been able to produce it hitherto at their own works. Owing to participation in these central power stations, the financial burdens of the municipalities will individually not be heavy. In the case of Nuremberg, for instance, the city will for a long time to come only have to provide about 2,000,000 marks (£100,000). If the town itself built new or additional works, it would have to provide more capital, perhaps 5,000,000 to 6,000,000 marks (£250,000 to £300,000). Furthermore, Nuremberg, as already mentioned, receives the current cheaper than it could ever be produced in its own works. Lastly, there need be no fear that any works or factories will have cause to leave the town or the district, as other districts cannot offer lower current prices than Nuremberg. All this applies equally to other towns connected with the Franconian or any of the other above-mentioned works.

Book Notices.—*Portable Wireless Telegraph Stations.*—A volume recently issued by Marconi's Wireless Telegraph Co., Ltd., with this title, deserves to be regarded rather as a treatise on portable wireless stations than a manufacturer's private publication. After a brief sketch of the history of the subject, which dates back some 10 years, various technical subjects are discussed in detail, and the best conditions for the working of wireless stations in warfare—the principal requirements being that the transmitter should not be sharply tuned, the receiver should be capable of very sharp tuning, and that changes of wave-length should be effected with a single handle. All these conditions are satisfied by the Marconi field stations. Secrecy is secured by quick change of wave length. The different types of portable stations which have been developed by the company are then described, ranging from the 1½-KW. "F" (cart) station, with a range of 150 to 200 miles, to the "K" type knapsack station, with a range of 5 to 7 miles, of which extreme portability and ease of manipulation are the leading characteristics. This apparatus can be carried by four men in loads of 20 lb. each, and can be erected by two men in five minutes. Cavalry and airship equipments, and various accessories, are also described, and the book, which is beautifully illustrated with half-tone views and diagrams of connections, concludes with a very short account of the company's present organisation. It is certainly an admirable production.

"Atti della Associazione Elettrotecnica Italiano." October 31st, 1912. Milan: Stucchi, Ceretti & C.

"*Proceedings* of the American Society of Civil Engineers." Vol. XXXVIII, No. 8. October, 1912. New York: The Society.

"*Bulletin* of the Association des Ingenieurs Electriciens." July, 1912. Liége: The Association. Price 4 fr. 50 c.

"The Science of Illumination." By Dr. L. Bloch. 1912. London: John Murray. Price 6s. net.

"Primer of Scientific Management." By Frank B. Gilbreth. 1912. London: Constable & Co., Ltd. Price 4s. net.

"*Journal* of the Western Society of Engineers." Vol. XVII, No. 7. September, 1912. Chicago: The Society. Price 50 cents.

"First National Mine-Safety Demonstration, Pittsburg Pa., October 30th and 31st, 1911." By H. M. Wilson, A. H. Fay and G. S. Rice. "Notes on Mineral Wastes." By Charles L. Parsons. "Electrical Symbols for Mine Maps." By H. H. Clark. "Mine Fires: A Preliminary Study." By George S. Rice. "Methods of Determining the Sulphur Content of Fuels." By I. C. Allen and I. W. Robertson. Washington: Government Printing Office.

"The Arbitration Clause in Engineering and Building Contracts." By E. J. Rimmer. 1912. London: Constable & Co., Ltd. Price 2s. net.

"*Mechanical World* Pocket Diary and Year-Book for 1913." Manchester: Emmott & Co., Ltd. Price 6d. net.

"Science Abstracts." October 25th, 1912. Vol. XV, No. 10. Sections A and B. London: E. & F. N. Spon, Ltd. Price 1s. 6d. net each.

"Manuel Pratique de Soudure Autogène." By R. Granjou and P. Rosemberg. Paris: Office Central de l'Acetylene. Price 5 fr.

A Coming of Age.—On Saturday, October 26th, the shareholders, staff and employés of MESSRS. T. W. BROADBENT, LTD., of the Victoria Electrical Works, Huddersfield, together with their wives and families, met for a tea and social evening, at the invitation of Mr. T. W. Broadbent, the managing director of the firm, to commemorate his having been in business 21 years. Mr. Broadbent was supported by his co-directors, Messrs. G. A. Broadbent and F. W. Davies, and amongst the guests were Mrs. F. W. Davies, Mr. L. F. Senior (solicitor to the firm) and Mrs. Senior, and Mr. John D. Mackenzie (the Scottish agent of the firm) and Mrs. Mackenzie. The gathering was held at the Fields Congregational School, Kirkheaton, and was well attended, only three employés being absent. Mr. L. F. Senior proposed the toast of "The Firm," and after remarking that he was called in at the inception of the company, referred to the very satisfactory growth of the business, and predicted a bright future for it. In replying, Mr. T. W. Broadbent referred to his first start in business on his own account, 21 years ago, and the way in which, at the outset, he himself had often put in 15 or 16 hours a day on the bench and on outside work. The business had grown, and was in 1907 taken over by the present company. The past financial year had been a record one for the company, and he encouraged all the workmen present to continue to do their best for the firm, and promised that they should share in its prosperity. Mr. J. L. Stokes proposed the toast, "The Ladies," and Mrs. J. Holroyd suitably replied to the toast. After the tables had been cleared, an excellent programme of vocal and instrumental music was given. Dancing and games were also indulged in till a late hour. During the evening, Mr. G. A. Broadbent made a few encouraging remarks to the employés, and promised that, in commemoration of this event, he would give every employé over 18 years of age 2s. 6d., and every employé under 18, 1s., at the New Year. After various votes of thanks, the proceedings terminated.

Dissolutions and Liquidations.—TYPEWRITING TELEGRAPH CORPORATION, LTD.—A meeting is called for December 5th, at 87, Bishopsgate Street, London, E.C., to hear an account of the winding up from the liquidator, Mr. C. S. Beale.

ELECTRIC AND GENERAL ASSURANCE, LTD.—A meeting is called for December 9th, at 5, London Wall Buildings, London, E.C., to hear an account of the winding up from the liquidator, Mr. L. Maltby.

IMPERIAL ELECTRIC LAMP CO., electrical engineers, Market Street and Great Western Street, Moss Side, Manchester.—Messrs. T. Graham, J. Young, G. Artingstall, and F. A. Pidding have dissolved partnership.

Trade Announcements.—THE ELECTRICAL CO., LTD., have opened an office at 32, County Buildings, Corporation Street, Birmingham (telephone No. 3498 Central), with Mr. F. R. Unwin as representative engineer.

We are informed by MR. F. E. PHILLIPS, of 53, Victoria Street, S.W., that he has taken over the London agency of the St. Helens Cable and Rubber Co., Ltd.

MR. LIONEL MORRISON, for over 14 years with Mr. Emanuel Spence, has commenced business at 371, Linthorpe Road, Middlesbrough, as an electric bell fitter and lighting engineer.

Auction Sale.—MESSRS. WHEATLEY KIRK, PRICE AND CO. will, on November 26th and 27th, offer for sale by auction the electrically-driven rolling mill plant, machine tools, rails, loose tools and other effects of the English McKenna Process Co., Ltd., at Birkenhead, by order of the Receiver. The plant includes three 750-KW. Siemens-Willans three-phase turbo-generators, two 50-KW. D.C. exciter sets, a 150-KW. rotary converter, 54 motors (7·5 to 125 B.H.P.), switchboard, crane, B. & W. boilers, six 28-in. rolling mills and 500-B.H.P. motor, and various other electrical and other equipment, particulars of which are given in a list and brochure which may be obtained from the auctioneers (46, Watling Street, E.C.).

Bankruptcy Proceedings.—JOSEPH ARTHUR PROCTER, formerly electrician, but now warehouseman, late of Bradford and Shipley.—Receiving order made at Bradford on October 29th on debtor's own petition. First meeting, November 9th; public examination, November 13th.

The Ignition Magneto Industry.—Quite a large industry has sprung up in connection with the manufacture of magnetos for ignition purposes on motor-cars. One of the largest undertakings of the kind is that of the BOSCH CO., at Stuttgart, Germany. Started in a small way 25 years ago, by Herr Robert Bosch, this concern now employs about 6,000 persons, and turns out no fewer than 1,200 complete magnetos per day, this not including the production of the separate factories which have been established in France and the United States to supply the demands of those markets. No fewer than 160 different varieties and sizes of magnetos are manufactured, ranging from a miniature machine suitable for a motor-bicycle up to one for an internal-combustion engine of 2,500 H.P.

Catalogues and Lists.—THE HOLMQUIST ELECTRIC CO. (1911), LTD., 27, Kingly Street, Regent Street, London, W.—Illustrated and priced leaflets relating to the "Holmquist" replacement heater, electric hat pads, bed-warmers, irons, toasters, hair-drying apparatus and vibro-massage apparatus.

THE ELECTRICAL CO., LTD., 122-124, Charing Cross Road, London, W.C.—November stock list of A.C. and D.C. motors.

THE BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., LTD., Trafford Park.—Illustrated and priced leaflets relating to their small electric motors, with particulars of some typical ratings.

THE BRITISH ALUMINIUM CO., LTD., 109, Queen Victoria Street, London, E.C.—Illustrated leaflets respecting aluminium battery connections and aluminium in the automobile industry.

THE DIAMOND COAL-CUTTER CO., Stennard Works, Wakefield.—Eight-page pamphlet respecting the safety of the Diamond electric coal-cutter, and giving a description, with diagrams, of the Crossland patent automatic feed regulator for regulating the feed or forward travel of an electrically-driven coal-cutter.

MESSRS. ARCH. J. WRIGHT, LTD., 41, Beech Street, Barbican, London, E.C.—Price lists of the "Daylight" electric cycle lamp and of electric pocket lamps, torches and other novelties.

THE ESSEX ACCUMULATOR CO., 497-9, Grove Green Road Leytonstone, N.E.—Twenty-page catalogue containing full particulars, with illustrations and prices of their latest types of portable electric hand lamps (unspillable accumulator and dry battery types), also of the "Essex" dry battery and accumulator inspection sets and inspection torches, also dry and accumulator torches.

MESSRS. UNION ELECTRIC CO., LTD., Park Street, Southwark, London, S.E.—Advance copy of 12-page booklet entitled "The Survival of the Fittest," in which a comparison, with diagram, is made with a view to showing the superiority of the arc lamp over the metal-filament in the production of comparatively large quantities of light. Copies of the booklet will be sent to contractors on application.

MESSRS. W. H. PALFREYMAN & CO., 17, Goree-Piazzas, Liverpool.—Folder relating to their hydro-carbonated bone-black for case-hardening.

MESSRS. VERITYS, LTD., 31, King Street, Covent Garden, London, W.C.—Christmas trade publication No. 714, relating to "Aston" decorative lighting sets—miniature electric candle sets, flexible lighting strips for dining tables, festoon chain lamps, pocket and portable hand-lamps, electric torches, hair driers and vibrators, also electric radiators and table standards. This list is being distributed broadcast in view of the approaching season.

MESSRS. D. H. BONNELLA & SON, 58 and 60, Mortimer Street, Cavendish Square, London, W.—List No. 401 (20 pages), being Section B of their bell accessories catalogue. It contains prices and illustrations of wood, china and brass pushes, and door and window contacts.

MESSRS. FALK, STADELMANN & CO., LTD., 83/87, Farringdon Road, London, E.C.—36-page catalogue (No. 350) (supplementary to catalogue No. 302) giving prices and illustrated information

relating to a variety of electrical accessories, including "Efesca" tumbler switches, art metal switches and pushes, lampholders, shade-carriers and ceiling roses, "anti-shock" wall and floor sockets, safety hand-lamps, knife switches, ironclad switches and fuses, "Regal" lighting strip, electric light wires and cables, vacuum cleaners, and many other lines.

Messrs. Simplex Conduits, Ltd., 116, Charing Cross Road, London, W.C.—Mailing Card No. 193, drawing attention to their Mosaic silk shades of new design, which may be seen at their showrooms.

The Foster Engineering Co., Ltd., Wimbledon, London, S.W.—The company are issuing an arc lamp catalogue (flame, enclosed, photographic and open types), and copies will be sent on application. We have received a leaflet describing and giving prices of their "Regulus" single enclosed arc lamp.

The Radium Electric Co., 82, Hatton Garden, London, E.C.—Illustrated leaflets, giving latest prices of "Radec" metal-filament and carbon-filament lamps (pear, round, candle and tubular-shaped bulbs).

For Sale.—The buildings, tools, stores, stocks, &c., of the Sunbeam Lamp Co., Ltd. (in liquidation), Gateshead, are offered for sale by private treaty. See our advertisement pages in this issue.

LIGHTING and POWER NOTES.

Acton.—The Metropolitan Electric Supply Co. has informed the Council of its decision to reduce the price of current supplied to all Council buildings from 5d. to 4d. per unit (except to the Council Offices, Baths and Library, which are all lighted from plant installed at the Baths).

Australia.—The report prepared by Mr. G. A. Julius, the electrical expert who was commissioned by the North Sydney Municipal Council to inquire into the five proposals received by the Council for the installation of an electricity supply plant and distributing system throughout the municipality, also for the erection of a garbage destructor, has been placed before the Council. Mr. Julius stated that he understood that the Council had decided merely to enter into a contract for a supply of electric current for street lighting under some definite scheme, and also for the destruction of the municipal garbage at a fixed price. That decision eliminated almost the whole of the offers submitted. Had that course of action not been decided upon, he would unhesitatingly have recommended the continuation of negotiations with the City Council, and the ultimate acceptance of its offer. The only proposal which conformed to the conditions laid down was that submitted by the Northern Suburbs Electric Lighting and Power Supply Corporation, Ltd., and he recommended that its offer be provisionally accepted, final acceptance to be held over pending the completion of an agreement fully protecting the interests of the ratepayers.

It is reported that active steps are being taken in connection with the proposed scheme for a power plant at Bulli (N.S.W.), near the mines, for the supply to the Sydney City Council's undertaking, over some 45 miles of transmission line.

Bacup.—The Corporation has decided to apply for sanction to the borrowing of £1,000 for the extension of the electricity service.

Beckenham.—The U.D.C. has decided to apply to the B. of T. for a provisional order to enable it to supply electricity in the parish of Wickham.

Bentley.—The U.D.C. has passed a resolution consenting to the application of Doncaster T.C. for a prov. order for E.L.

Bettws-y-Coed.—The L.G.B. has sanctioned the obtaining of a loan in connection with the electric lighting undertaking.

Beauly.—The Beauly Electric Supply Co., Ltd., has been formed with a share capital of £1,000, divided into 1,000 shares of £1 each. The following are directors:—Messrs Daniel M'Garth, Beauly; E. G. Williams, Waterloo Place, Inverness; James Menzies, Blairich, Sutherlandshire.

Bootle.—The report of the borough electrical engineer, presented by the Electric Light Committee at the meeting of the T.C. on October 30th, included the statement that the existing sanction to loans for mains was obtained for meeting the normal development of the L.T. system for a period of three years from September, 1911, and that the requirements for H.T. mains are very uncertain. The Committee recommended that the sum of £3,200, approved for H.T. conduit line and cable, be included in the extension scheme, and that the material be not ordered until some definite information as to the Mersey Dock Board's requirements for the supply of current to the Gladstone Dock, Seaforth, is obtained. The recommendation was approved, and the resolution of the Committee of September 20th, 1912, approved by the Council on October 2nd, was varied accordingly.

Bradford-on-Avon.—Messrs. J. and W. Purves, of Exeter, have informed the U.D.C. that they intend applying to the B. of T. for a prov. order for E.L. The scheme has been explained to the Council, which has adjourned consideration of the matter.

Caldy (Cheshire).—The residential village of Caldy, in Wirral, affords an instance of what enterprise can accomplish in the matter of public lighting. This question has been under consideration for some time, and an estimate for gas illumination was obtained from the Hoylake and West Kirby Gas Co. There was, however, a power station, erected by the owners of the estate now being developed, for the supply of electricity for domestic purposes. The Hoylake Urban Council suggested, seeing that the Caldy Estate Co. was supplying electric light to its tenants, that public street lighting by this method would be preferable if the cost was reasonable. The surveyor has now reported that the estimated difference in cost would be £10 only in favour of gas. So it has been decided by the owners of the property to lay their own mains and to supply the current from the power station.

Canada.—In the new grain elevator for the Harbour Commissioners of Montreal, which will have a total capacity of 2,622,000 bushels, some 80 induction motors of 4,680 H.P. are installed, and the operation of the elevators and conveyors is controlled by a system of electric signals.

According to the *Standard*, the Calgary authorities have a proposal in hand to install a plant utilising natural gas for the production of electricity, at a cost of £100,000. With gas at 7½d. per 1,000 cb. ft., it would be possible to generate power at £2 1s. 3d. per H.P.-year, which is cheaper than hydro-electric power is sold at Niagara.

Colne.—The T.C. has decided to apply to the L.G.B. for further borrowing powers to the extent of £2,000 for the purpose of extensions to the electric mains.

Continental Notes.—Austria.—During the month of August, 36 power schemes were laid before the Austrian Hydrographic Department, of which 24 secured concessions. The most considerable of the schemes were those of the Syndicat Donau-Kraftwerk Wallsee, situated at Perg, in Upper Austria, the gross capacity of which will be equal to 30,000 H.P., and the "Malserheide" Electricitätswerk, at Schlanders, in the Tyrol, with a gross capacity of 2,400 H.P.—*Elek. und Masch.*

France.—La Société Union Electrique, which has already a large generating station at Saut-Mortier, proposes to establish a new plant near Doucier, in the Jura, to utilise the power of the overflow water from Lake Chalain. It is estimated that about 2,000 H.P. is available. The current generated will be distributed for lighting and power purposes to Lous-le-Saulnier and other small towns in the district.

The Société Anonyme Energie Electrique de Mons-en-Pévèle has been formed at Lille to generate and supply electric current to a number of communes in the Department du Nord.

Sweden.—The Stora Kopparbergs Bergslags A.-B., which possesses a power station at the Bullerfalls of a capacity of 24,000 H.P., now proposes to develop the Forshufudfall, the estimated output of which is 20,000 H.P. The company lately placed an order for a Helferstein silicious iron-ore furnace, for the former station, equal to 12,000 H.P., for the electric smelting of iron ore.—*Affärsvärlden.*

Switzerland.—The T.C. of Zurich has applied to the Federal Council for a loan of £78,400 for the establishment of a power house to act as a reserve to that situated at Gugach.—*Revue Pratique de l'Electricité.*

Germany.—An agreement has been come to between the Bavarian Government and the A.E.G., of Berlin, whereby the east and north of Upper Franconia will be supplied with electricity, in which two administrative districts of the Upper Pfalz will participate. The cost of the scheme is put in round figures at £2,500,000.—*Zeit. des Oest. Ing. u. Architektenwesens.*

Crewe.—The electrical engineer has been requested to report upon the question of lighting Bradfield Road, Broughton Road, and part of Mablin's Road with gas or electricity. At present oil lamps are in use.

Deal.—An extension of time for carrying out the E.L. order has been granted to the Sandwich, Deal and Walmer Electricity Co. Another order is being applied for by Mr. W. T. Presland, and the T.C. has applied for full particulars before coming to any decision.

Dover.—The Electricity Committee has agreed, subject to confirmation by the T.C., to offer to supply current to the War department for various buildings in the town, including Fort Burgoyne and Castle Barracks, not at present connected, at the following alternative rates:—Up to 15,000 units per annum, 4d. per unit; 30,000 units, 3½d.; beyond, 3d.; or up to 20,000, 3¾d.; 30,000, 3½d.; beyond, 3d.

Epsom.—The B. of G. has decided to obtain expert advice on the question of electric lighting at the Workhouse.

Guatemala.—The municipality of Palin has taken steps to arrange for the lighting of that town with electricity. The principal square, opposite the municipal building, is to be furnished by the electric company with powerful arc lights, and light and power will be at the disposal of the town and its inhabitants at very reasonable rates.

Hamilton.—The remarkable progress which has been made in the use of electricity was very interestingly illustrated by

an exhibition at Almada Hall last week, under the auspices of the Hamilton Electricity Supply Co. Three apartments were used in giving a display of the many useful domestic services to which electricity can be applied; in one room it was demonstrated that the "Tricity Cooker" can perform with satisfaction everything that the best fire or gas oven can accomplish in the way of preparing meat for the table. The Carron Co.'s electrical cooking stove was also a wonderfully useful arrangement, performing all the duties that the cook demands at a small cost and with great dispatch. In another room was exhibited the efficiency of electricity for ironing purposes. As another example of the usefulness and capacity of the electric cooker, tea was served to the visitors in a third apartment. Mr. Salter, the local manager of the Hamilton Electricity Supply Co., is to be congratulated on his enterprise in arranging the exhibition.

Hornsey.—The rate of charge for current for outside lamps is in future to be 3d. per unit in cases where there are three points of not less than 200 C.P. each or one point of 500 C.P. It has been considered inadvisable under the existing conditions to modify the present rate of charging for current for power.

Hove.—With reference to the recommendation to purchase the undertaking of the Electric Supply Co., previously referred to in the ELECTRICAL REVIEW, the T.C. has decided to defer further action until the matter has been considered at a ratepayers' meeting.

Kingstown.—Last week a meeting was held to discuss some scheme which would result in the town being properly lighted. A resolution to approach the Tramway Co. having been proposed and seconded, and an amendment proposed and seconded, the chairman said that different companies had offered to light the town. It was for themselves to say whether they would give themselves over to the new company with its capital of £42,000, or to the Tramway Co. with its enormous power, a company which was not only progressive, but had its electric mains running past their doors. The amendment was lost, and the resolution to approach the tramway company was carried. A joint deputation of the residents of Kingstown, Blackrock and Dalkey was appointed to wait upon the company.

Leicester.—On the recommendation of the Finance Committee, it was decided at a special meeting of the T.C. that additional provision should be inserted in the proposed Bill for the purpose of obtaining authority to extend the area of supply of electricity so as to include certain parishes adjoining the borough.

Leicestershire.—The Leicestershire and Warwickshire Electric Power Co. has applied to the B. of T. for consent to erect overhead lines for the transmission of current at a pressure of 6,600 volts for the purpose of supply under the Acts of 1902 and 1904. One line will run from Burbage Common *viâ* Huncote to the junction of the Enderby Railway, and the other from Elmesthorpe station to Earl Shilton.

Littleborough.—With reference to our note on page 657, it should be stated that at the Greenvale Mill, owned by Messrs. Fothergill & Harvey, 20 of the motors installed were supplied by Messrs. Siemens Bros. Dynamo Works, Ltd., and amongst these are the earliest motors installed in this mill.

Maidenhead.—The T.C. has applied to the L.G.B. for a loan of £1,700 for electricity purposes.

Manchester.—A L.G.B. inquiry was held on the 1st inst. into the application of the City Council to borrow £87,160 for the purposes of the electricity department, £68,820 being required for extensions of plant at Stuart Street station where it is proposed to install a 15,000-KW. turbo-alternator (particulars of which were given last week, on page 710). Other expenditure was in respect to distributing stations and hired motors.

The Manchester Ratepayers' Association opposed on the ground that power consumers were being given a preference over others, and that the demand for power supply would not arise if a fair rate were charged. Mr. Howarth, chairman of the E.L. Committee, said the result of the year's working was proof that satisfactory profit was being earned. The Corporation had special contracts with about fifty firms, who were supplied on similar terms, no preference being shown. The secretary of the Association objected to "secret prices," suggesting that in some cases energy was being sold at a loss; he also criticised the view that the sinking fund was available for depreciation, which altered the whole basis of cost, and left him certain that losses were being incurred. It was pointed out by the town clerk that £816,000 had been paid to sinking fund and £182,735 to depreciation and renewals, and Mr. Pearce stated that there was a margin of profit on all their sales. He also pointed out that the methods of the department were just as effective as those of a private company. They paid off their capital by the sinking and renewals fund, where the private company set aside part of their profits for renewal. Reference having been made to the gas undertaking, it was pointed out that that had been in operation for about 100 years, and had done a large amount of work out of revenue.

Mansfield.—The B. of G. has decided not to alter the specifications for the electric light installation at the workhouse, reference to which was recently made in the ELECTRICAL REVIEW. Further tenders are to be invited, and a loan for the additional cost involved has been applied for.

St. Helens.—The Corporation's application for sanction to borrow £5,000 for purposes of the electricity undertaking has formed the subject of an inquiry by the L.G.B. The amount named represents excess expenditure on three accounts of the Electricity Committee. It was stated that loans had been sanctioned for mains and new machinery, but the increased demand for electricity had caused the Committee to overspend. The electrical engineer (Mr. E. M. Hollingsworth) said it was intended to ask the Council for a further loan which would date from March last; £400 or £500 had been spent in excess, but he would like to have £4,000 to go on with.

The B. of T. has consented to the Council giving a supply of current at a pressure of 500 volts to the British Electric Detonator Co., Ltd., by means of an overhead line. A similar supply is to be afforded to the works of the Ravenhead Sanitary Pipe and Brick Co., Ltd., and to the glass works of Messrs. Mooney, Hall Street.

Sevenoaks.—The U.D.C. on October 29th, at a special meeting, sealed an agreement transferring the E.L. order, 1910, to the newly formed Sevenoaks and District Electricity Co., Ltd.

Sheffield.—A deputation representing the E.L. Committee visited London this week to interview the local members of Parliament, with a view to obtaining their support in the direction of restoring the clauses which were cut out of the Sheffield Bill by the House of Lords. As the Commons passed the wiring and fittings clauses, it is hoped that they may agree to restoring them.

Shipley.—The U.D.C. has applied to the L.G.B. for an additional loan of £1,000 for a new condenser for the electricity works. The Council has obtained a new customer for a large use of current for power. The Scott Engineering Co., which intended taking a supply of current from the Council, has intimated that it has had to obtain power from another source, as the Council could not give an immediate supply.

Southborough.—The Gas and Water Committee has unanimously recommended the U.D.C. to apply to the B. of T. for a prov. order for electric light.

South Africa.—On October 15th, the stores at the Johannesburg electricity works caught fire and were burnt out, large quantities of cable, oil, tar, meters, &c., being destroyed. Owing to the position of the burning building and the direction of the wind, the power station and gasometers were in considerable danger, but were saved in the end.

Stoke-on-Trent.—A L.G.B. inquiry was held on October 29th into an application by the T.C. to borrow £16,969 for extension of the electricity undertaking. Dealing with the application, the town clerk said the amount asked for was in respect of various sums overspent on the undertakings between October, 1908, and March 31st last. As for the future, the Committee was having to expend considerable sums on mains and other things—sometimes amounting to £1,000 a month—and it understood that the board would not be averse to giving a prospective sanction. With the permission of the Inspector, therefore, he would make a further application for sanction to prospective expenditure of £10,000, of which £7,000 was for extension to mains and £3,000 for transformers and sub-stations.

In the case of the original application, permission was given to amend the amount from £16,969 to £17,196, the difference being made up of a sum of £227, a balance from the old sanction on the Burslem undertaking which was not required.

Mr. Yeaman stated that the £17,196 was divided among the towns as follows:—Burslem, £5,539; Hanley, £7,785; Stoke, £3,132; and Longton, £739. The money was to be spent upon: Buildings, £1,119; machinery, £2,291; accumulators, £19; transformers £1,809; mains and services, £11,539; switchboards, £194; instruments, £82; general expenditure, £35; sinking well, £104.

Reverting to the supplementary application of £10,000, the engineer, in reply to the Inspector, said that from April 1st to September 31st, £3,440 had been actually spent, £2,660 on mains, and £800 on transformers. He estimated that the balance of £6,500 would last 12 months.

Surrey.—If sufficient support is forthcoming, steps will be taken to supply Clandon, Horsley, Effingham, Bookham, Cobham and Oxshott—all Surrey villages—with electricity. Preliminary steps to put the scheme in operation have, it is understood, already been taken.

Sunderland.—The town clerk has received a letter from the L.G.B. as to the recent application by the Council for powers to borrow the sum of £37,200 for the purposes of extension and new plant. The Board sanctions the loan, but the letter states that the obsolete machinery at the Dunning Street station, which is used as a stand-by in case of a breakdown of the tramway supply plant, must be got rid of in the course of a year or two, as it cannot be allowed to remain in the balance-sheet of the undertaking.

Taunton.—A demonstration of electrical cooking with "Tricity" appliances was given last week by Mr. F. S. Grogan, who lectured before interested audiences at the Victoria Rooms. During his stay, the members of the Electricity Committee were entertained to an electrically cooked luncheon by the chairman, Mr. Grogan personally superintending the preparation of the meal.

U.S.A.—The *Globe* describes a small wind-power installation at an American dairy farm—a 12-ft. windmill being used to work a drill press, grindstone, corn-sheller, saw, washing machine, and feed grinder, and a 6-ampere, 35-volt dynamo at the base of the tower.

The dynamo is solely used to charge a battery from which the farm and outbuildings are illuminated. The mill, generator, battery, wiring lamps, &c., could, it is stated, be duplicated for $250; but surely this should read £250.

Watford.—The B. of G. has decided to have the electric light installed in the old buildings at the workhouse.

Whitworth.—At a special meeting of the U.D.C. on Friday last, it was resolved that the Council be recommended to enter into an agreement with the Rochdale Corporation providing for a supply of electricity in bulk upon the best terms that can be secured from the Corporation, and that such supply be distributed throughout the district for lighting and power purposes, and that the necessary steps be taken for putting into operation the powers contained in the Whitworth Electric Lighting Order, 1905. A deputation was appointed to interview the Rochdale Electricity Committee to discuss terms with reference to the supply of electricity.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—With a view to improving the car service to Torry, the T.C. has agreed to carry out an extension of the double track at the corner of Guild Street, at an estimated cost of £540.

Australia.—It is stated that the direct-current system of traction at 1,500 volts, with overhead trolley construction, has been definitely decided on for the Melbourne suburban railways electrification, and that well-known British manufacturers are to receive the orders for turbine, electrical and railway plant.

In connection with the electrification of the Melbourne suburban railway stations, the Victorian Government has agreed to erect a station forthwith at Yarraville for dealing with the peak loads for railway and other purposes. If satisfactory offers are obtained, tenders are to be invited for the balance of power required generated at the coal-fields. These offers may be for 5,000 KW. and upwards, not exceeding 25,000 KW., to be supplied at a load factor of from 50 per cent. to 75 per cent. per annum. Tenderers will also be asked to state the price at which they are prepared to distribute power to manufacturers outside the existing Melbourne area.

The Prahran and Malvern Tramway Trust has received permission from the Government to extend its borrowing powers from £300,000 to £500,000.

The annual report of the Adelaide Municipal Tramways Trust for the year ended July 31st last shows gross earnings amounting to £282,120, and working expenditure amounting to £189,231. The balance for appropriation, after meeting certain expenses, was £93,047.

Blackpool.—In a recent speech, Alderman Brodie foreshadowed the introduction of motor-'buses for the out districts, and stated that a scheme was in preparation for the illumination of the whole of the Promenade next year.

Canada.—A survey is being made for an electric line from Port Haney (B.C.), on the Canadian Pacific, and on the Fraser River, to Lilloset Lake. It is suggested that the British Columbia Electric Railway Co. is responsible for the work.

Colne.—At the T.C. on October 31st, Alderman Hewitt-Dean moved, "That the T.C. do agree to purchase the undertaking of Colne and Trawden Light Railways Co., under the provisions of Colne and Trawden Light Railways Act, 1901, the amount of purchase money to be fixed by arbitration, and that the Town Clerk be instructed to take steps to obtain the necessary powers, by provisional order or otherwise, to complete the purchase." He explained that the resolution was a culmination of a series of negotiations with the railway company extending over 12 months. He said no doubt under arbitration the purchase money would be a fair one, and he trusted that when it came under their control the undertaking would prove a good investment. The resolution was adopted.

Colwyn Bay.—The Llandudno and Colwyn Bay Electric Railway Co., Ltd., has given notice of its intention to apply to the B. of T. for an extension of three years of its powers to construct an electric tramway from the present terminus in Colwyn Bay to its authorised termination near the Dingle, and for sanction to abandon the portion of the line previously authorised from Dale Street, Llandudno, to the Deganwy Promenade. The part of the authorised line which it was now proposed to abandon is practically all within the Conway borough area, and the Conway T.C. has decided to make an objection to the company's action.

Continental Notes.—AUSTRIA.—So far the motor fire engines employed in the Vienna Fire Brigade have been electrically propelled. The Austrian Daimler Motor Co., of Neustadt, has, however, just supplied a new petrol-electric motor fire engine to the brigade.

ITALY.—It has been definitely decided, says the *Giornale dei Lavori Pubblici*, to convert to electric traction the line from Monza to Lecco. The State Railway Administration is about to call for tenders for the work in three sections. In addition orders have been placed for 58 electric locomotives, which will serve partly for this line and partly for the Giovi tunnel line. The locomotives will be capable of a speed of 120 km. per hour. The section from Monza to Milan will be subsequently electrified. The conversion of the Monza-Lecco line is excepted to be completed by the end of 1913.

The isolation of Cortona from the State railway system is now about to be remedied by the construction of an electric tramway between the city and the railway.

La Societá Subalpina di Imprese Ferroviarie, of Turin, has secured a concession for the construction and working of a narrow gauge electric railway between Domodossola and Corfine and Svizzero (Locarno).

The report first current that the generating station at Bardonnechia, which serves the Mont Cenis line, had fallen a prey to the flames, involving a loss of 2,000,000 fr. and an interruption to the traffic of several months is, happily, found to be overstated. According to the *Giornale dei Lavori Pubblici*, electric traction will be resumed in the course of a few weeks, and the damage, although considerable, will be covered by a sum much less than that named, which is double the first cost of the entire installation. Bardonnechia is a station of the second order only, the chief station being Chiamonte, the property of the Municipality of Turin. The fire is attributed to the accidental ignition of some oil containers in the neighbourhood of the switchboard, where the most damage was done.

RUSSIA.—The Committee for New Railways, after investigating plans, has decided to recommend the construction of a railway from Lodz to Lenchitza, passing by way of Alexandrov, Egerzh, and Ozorkov. At the same time the Committee examined plans for the construction of various electric tramways in the district of Lodz.—*Board of Trade Journal.*

In connection with the International Automobile Exhibition which is to be held in St. Petersburg next year, the Standing Exhibition Committee for German Industry points out that the types of motor-cars for which the Russian Minister of War would become a purchaser should be capable of carrying radiotelegraphic apparatus, radiographic appliances, and field telegraphic installations.—*Elektrotechnische Zeitschrift.*

GERMANY.—The Senate of Hamburg has introduced a Bill for the building of an electric express line from Hamburg to Langenhorn, one of its most distant suburbs. The line is estimated to cost 7,160,000 marks, besides 5,166,000 marks for sundry technical material already acquired. The line is to be worked by the High Level Railway. This will make the fourth electric railway scheme which the Hamburg authorities have now under construction, and with the just completed high and low-level electric railways, afford striking evidence of the wonderful expansion which is taking place in the traffic arrangements of this old free port.—*Elek. u. Masch.*

SWITZERLAND.—A joint stock company is to be formed at Basel for the construction and working of an electric railway to run at first to Liestal, and eventually to Sissach. Its estimated cost is 2,200,000 fr.—*Elek. Zeit.*

TURKEY.—According to the *Times*, the Belgo-German financial group formed at Constantinople, is reported to have obtained definite authority to construct the Metropolitan line from Paxim to Badagiz. The group was formed to take over the principal Constantinople tramway system and the railway from Galata to Pera. The group proposes to acquire the monopoly of electric lighting in the capital also.

FRANCE.—Further details are to hand of the large electric tramway scheme projected in the Department of the Manche. It comprises 10 different lines, of an aggregate length of 238 km., for the construction of which sums totalling 20,585,000 fr. have been allocated. This is exclusive of a line, Mortain to Juvigny, added to the list by the Conseil Général, which will be the object of a special disbursement.—*La Lumière Electrique.*

Delagoa Bay.—In the course of his speech at the annual meeting of the Delagoa Bay Development Corporation, Ltd., held in London last week, the chairman, Mr. H. K. Heyland, referred to the tramway receipts, and said that the passenger and goods traffic had increased by 9 per cent., the number of passengers carried having increased by 131,285, or nearly 14 per cent. Electric power supplied from the tramway station for railway and wharf purposes and for other consumers had increased by 49 per cent., which was considerably in excess of their expectations. They had ordered further generating plant up to modern requirements of 400 KW. to be installed at the tramway station, the estimated cost, including erection, being £3,000. When completed it was anticipated that an economy in working would result of about £1,000 per annum. The increase in gross receipts from tramways and power supplied amounted to £3,238. On the other hand, expenditure in operating costs had increased by £3,927, largely due to an expenditure of about £1,000 in overhauling the whole of the rolling stock.

Dewsbury.—The Corporation has under consideration a communication from the Huddersfield Corporation, asking for the consent of the Corporation to the construction of a tramway within the borough for which powers are being sought in the Huddersfield Corporation Tramways Bill. The route of the proposed tramway is from the existing terminus at Bradley, along Cooper Bridge Road, through Mirfield to Steanard Lane, in the borough of Dewsbury. Certain recommendations were made by a sub-committee, but the General Purposes Committee has deferred further consideration until the next meeting, the sub-committee in the meantime to watch the proceedings and report thereon.

Doncaster.—In connection with the extension of the Bentley tramway route, particulars of which are given in our "Contracts Closed" column. The estimated cost of the extension is £3,650, and other electrical work about £1,400. A further £2,550 will be required for additional cars, bringing the gross cost up to £7,600.

Edinburgh.—Most of the tramways in the East of Scotland are already municipalised, and now Edinburgh, which has been a notable exception, will shortly open negotiations with the object of taking over the control of the tramway service. At last week's meeting of the Town Council, the recommendation of the Tramway Committee that the Corporation "should resolve that they shall themselves undertake the working of the tramway system on the expiry of the present lease of the tramways to the Edinburgh and District Tramways Co., Ltd.," was agreed to without discussion. It is worth recalling that Leith, Edinburgh's near neighbour, acquired the tramways within its own territory, and later electrified that portion of the system, but throughout Edinburgh the cars are all on the cable principle.

Leeds.—The Tramways Committee has decided to apply for authority to continue the railless service to Drightlington and thenceforward to the existing tramway at Morley. It is also proposed to run a railless service from Low Road, Hunslet, to the Crown at Wortley.

London.—The Highways Committee of the L.C.C. is recommending that Parliamentary sanction be obtained for the construction of a railless traction system from Lee Green to Eltham, the estimated cost of the equipment, exclusive of cars, sheds, &c., being £7,380. The line is a necessary link between two tramway termini.

A rather serious collision occurred on September 29th between two L.C.C. cars at Brockley, involving injuries to 17 persons. The particular place was the scene of an accident in September last year, when a car overturned; in this case the collision was due to one car overtaking another standing at the bottom of a gradient, the brakes apparently failing to act.

Middlesex.—At the last meeting of the C.C. it was decided to raise no objection to the Metropolitan Electric Tramways, Ltd., promoting a Bill in the ensuing Session of Parliament for the purpose of obtaining powers to work a railless traction system in Broad Lane, Ferry Lane, and West Green Road, Tottenham, provided that a clause is inserted empowering the C.C. to take over the powers of the company under the Bill.

Nottingham.—The Notts. County Council has provisionally approved of a scheme of road widening which has been submitted by the promoters of the Notts. and Derbyshire Tramways Co., with a view to the laying of tramways between Langley Mill and Nottingham.

Rochdale.—The Tramways Committee has declined to construct and run electric tramways in the Wardle district, but it was stated at the T.C. that, if the Wardle Council would lay the track itself, the Tramways Committee would be prepared to run electric cars at cost price.

Salford.—The Tramways Committee has decided to grant increased pay to the staff. The concession means an increased yearly expenditure of £2,100.

Stainland.—The Huddersfield Corporation has intimated to the D.C. that at present it cannot see its way to extend its tramway system to Stainland.

Tasmania.—It is proposed to extend the Hobart tramways, and the cost is estimated at £17,300, including four cars.

U.S.A.—It is proposed to operate electrically the 38 miles of the Ocean Shore Railway from San Francisco along the coast. In this connection, it is stated that if the experiment now being made by the Pennsylvania Railway in running a train with Edison-Beach storage battery cars is successful, this method will be adopted on the Shore line. The latter has up to the present been steam operated, but this has proved expensive, and the heavy cost of electrification on normal lines was also prohibitive.

The trial trip of the train, consisting of three battery cars, on the Pennsylvania, showed that for the round trip of 49 miles, 136,800 units were consumed (battery output), or ·040 unit per ton-mile, and ·926 unit per car-mile. The weight of the battery is 4,600 lb., and of the complete car 38,700 lb., 200 cells per car being installed.

West Bromwich.—A special meeting of the Council is to be held to determine upon the expediency of promoting in the next session of Parliament a Bill empowering the Council to provide and work a railless traction system, to provide and work motor-omnibuses, and to effect street improvements, &c.

TELEGRAPH and TELEPHONE NOTES.

Australia.—In view of the position assumed by the Commonwealth Government in connection with wireless matters, and particularly having regard to the building of stations on a system which is alleged to be an infringement of patents now existing, the two companies principally interested, viz., Marconi's Wireless Telegraph Co. and the Australian Wireless Co., Ltd. (Telefunken system), have agreed to sink their differences and take joint action to secure their rights and the future protection of their patents.

The work of erecting wireless stations on the west coast has now been taken in hand seriously. The station recently completed at Pinkemba, near Brisbane, has been opened, and the Adelaide and Fremantle stations are expected to be opened shortly.—*Australian Mining Standard.*

Canada.—The contract between Marconi's Wireless Telegraph Co., Ltd., and the Canadian Government for the operation and maintenance of nine additional stations on the Great Lakes of Canada has been signed. When these stations are completed the Canadian Co. will receive an additional subsidy from the Canadian Government of $31,500 per annum. The agreement is for a period of 19 years.

France.—The Under-Secretary of Posts and Telephones paid a visit recently to Antwerp with a view to inspecting the semi-automatic telephone exchange of the Bell Telephone Co. there. The visit is supposed to be connected with an intention to introduce into Paris this system, which, says the *Elek. Nachrichten*, is superior to that of the Siemens & Halske Co. in essential technical particulars, affords greater security in working, and is considerably cheaper.

Germany.—A great central wireless station is to be built at Düsseldorf, after the style of, but on a larger scale than, the Eiffel Tower at Paris. The engineering firm of Dech & Paetz have the contract in hand. The iron tower will rise 200 m. higher than the Eiffel Tower, and will have an opening of 195 m. between the pillars. At 95 m. from the ground will occur the first arch, and at 450 m. the last platform. From this platform the highest point will be reached by a spiral staircase.—*Industria e Invenciones.*

Imperial Wireless System.—On Wednesday last week, as briefly mentioned in our last issue, Sir A. F. King was further examined by the Select Committee on the Marconi agreement. He said that the Admiralty were capable of erecting 2,000-mile stations, though they had no experience beyond 1,000 miles. In January last the War Office objected to delay. A Sub-Committee of technical experts was appointed by the Imperial Wireless Committee to investigate the Poulsen system, which reported that the system was fully capable of doing the work, but that the necessary staff and experience were lacking, and that the stations could not be erected at the price quoted. Their estimate was £53,700 per station, which compared with the Government estimate of £60,000 and the Marconi estimate of £82,000. The Sub-Committee asked for further information, but it was not supplied. The report was very important, but it was entirely theoretical, and it was never communicated to the Wireless Committee; he had no doubt that it would not have modified their decision, because they had already made up their minds. In his opinion, the technical Sub-Committee was appointed merely to satisfy the experts. The Wireless Committee having come to a decision, the Treasury would not attach much weight to anything the experts might say. The report was not presented to any of the Government departments.

The right of inspection could not be exercised by the Marconi Co., except in the case of entirely new stations; and even then the company would have to show good cause for suspicion of infringements of their patents. The company had experienced great difficulty with the War Office in obtaining information for this purpose in past years. There would be no right of inspection of Admiralty stations. The German Government had placed a contract with the Telefunken Co. for long-distance communication up to 1,900 miles between the Caroline and Solomon Islands and Samoa. It was doubtful whether the National Electrical Signalling Co., of America, could cover a distance of 2,000 miles, as they claimed. The Poulsen system had not been proved capable of working over a distance of 2,000 miles, or of working by day at all. The Marconi Co. were ready to guarantee key working, but not automatic working, during violent atmospheric disturbances, and had proved their ability to overcome such disturbances in South America. The adoption of duplex working had necessitated the rearrangement of the whole scheme of Imperial wireless communication, and the duplex system was not regarded with favour by either the War Office or the Admiralty, as the use of two separate stations connected by telegraph laid the apparatus open to derangement. He thought the real cost of the Marconi system would come out at £90,000 a station. If the Poulsen system proved to be the best, as it was the cheapest, they would cease using the Marconi system.

On Monday the Committee resumed the examination of Sir A. F. King, who stated that the cost of the Marconi system exceeded that of the Poulsen system by £180,000, exclusive of the 10 per cent. royalty.

It appeared that certain documents had been sent to some members of the Committee and not to others, and the Committee announced that all communications must be sent to the clerk to the Committee.

Sir A. F. King, in reply to questions, said that the cost of converting a Marconi station to the Poulsen system would be only £13,000. As long ago as 1907 the Poulsen representatives said they were arranging for a satisfactory service to America, and expected to send 100 words a minute, but nothing had been done that he knew of. The War Office and Admiralty were quite agreeable to the agreement as concluded.

Mr. Isaacs agreed that the company should lose the royalty if the Government ceased using the Marconi system, but requested that this important condition should be kept secret; it was, however found to be impossible to comply with his wish.

The witness admitted that the suppression of the report of the Technical Sub-Committee might have been an error of judgment; but when the Poulsen people failed to meet the conditions that had been laid down, the Postmaster-General thought it was hopeless to send forward the report, which recommended the Poulsen

system. It would certainly have made no difference whatever. The Poulsen Co. had no just cause for complaint: the department gave them a station in Ireland five years ago, and another in Northumberland, and had never refused them any licence they had asked for. No pressure had been put upon him with regard to the contract from any quarter, nor had there been any leakage of information. The Attorney-General was absolutely in ignorance of the whole thing. He thought there would be a loss on the system for a few years, but its strategic value was so great that, no matter what the loss, the stations must be erected. It was a more favourable bargain than they might have expected, seeing that the Marconi Co. was the only one that could show working at 2,000 miles. It was at present a choice between Marconi and no one.

Japan.—Arrangements are said to be in hand for the establishment of a wireless telephone service between Tokio and Yokohama.

There are now 4,100 telephones in use in Yokohama, and owing to the steady increase, it is proposed to establish, next year, a new exchange in the suburbs of the city.

Military Wireless Telegraphy.—A committee has been appointed by the Secretary of State for War, to consider the use of wireless telegraphy in the Army. The chairman is Sir Henry Norman, M.P. The proceedings of the Committee are confidential.

New Italian Cable.—The Italian Government has ordered from an English works a cable about 30 km. in length, with continuous loading on the Krarup system. The cable has two conductors each consisting of seven copper wires 0·7 mm. in diameter, upon which is wound a continuous layer of soft iron wire 0·2 mm. in diameter. The cable is made in lengths of 300 m. At 15° C. the copper resistance with continuous current is 11·745 ω per km., and with alternating current of 1,000 cycles 12·546 ω. The capacity is 0·0894 mfd. per km., and the inductance with alternating current of 1,000 cyles 5·872 millihenrys. The specific damping coefficient β = 0·024 per km. of double conductor at 1,000 cycles, which is 58 per cent. less than that of the same cable without loading.—*Journal Télégraphique.*

New Zealand.—The chief electrical engineer of the New Zealand Post and Telegraph Department, Mr. T. Buckley, says the *Australian Mining Standard*, has recommended that the more extended use of the telephone should be promoted as far as possible; that the automatic system of telephony should be adopted for Auckland, Christchurch, Dunedin, and Wellington; and that the Western Electric Co., London; Messrs. Siemens Bros., London, who supply the Siemens-Halske system; and the Automatic Electric Co., Chicago, who supply the Strowger system, be invited to tender for a full automatic equipment for Wellington.

Switzerland.—Since the middle of October the Federal station at Zurich has been in wireless communication with the Eiffel Tower and with the Norddeich station. It receives daily from the Eiffel Tower the international time signal, and a series of meteorological communications regarding the condition of the weather on the coasts of the North Atlantic. The wireless connection with the Eiffel Tower has proved to be excellent, and not the least disturbance has occurred. The station was equipped by the Gesellschaft für Drahtlose Telegraphie, Berlin, under the leadership of Dr. Eichhorn-Zurich.—*Elek. Nachrichten.*

Wireless in the Antarctic.—The *Australian Mining Standard* states that faint signals have been received at Macquarie Island from the wireless station in Adelie Land, in connection with Dr. Mawson's Antarctic expedition. Apparently the apparatus, which was damaged on landing, has been put in repair.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia. — South Australia. — December 11th. Line material (Schedules 250-252), and submarine telegraph cable and cable tank, for the P.M.G.'s Department. See "Official Notices" November 1st.

December 18th.—Telegraph and telephone material, for the P.M.G.'s Department. See "Official Notices" to-day.

December 17th.—Three sections of common-battery multiple switchboard and other equipment, for the P.M.G.'s Department. See "Official Notices" October 25th.

Victoria.—December 31st. Thirty detectors, for the P.M.G.'s Department. See "Official Notices" to-day.

November 8th and 12th.—(*a*) 340 A.C. and 800 D.C. electricity meters; and (*b*) insulated copper cables, for the Melbourne City Council. See "Official Notices" October 25th.

New South Wales.—December 11th. Telegraph cable, for the P.M.G.'s department. See "Official Notices" November 1st.

December 23rd.—An Australian exchange states that the Sydney Harbour Trust is inviting tenders for electric cranes and geared pulley blocks, for handling cargo at Nos. 8 and 9 berths, Dawes' Point to Miller's Point.

The Sydney Municipal Council, acting upon the recommendation of the city electrical engineer (Mr. H. R. Forbes Mackay), has decided to invite tenders for the supply of two electrically-driven motor lorries, at an estimated cost of £825 each. Charging apparatus and switchgear is also to be purchased, at £130.—*Tenders (Mining and Engineering Review).*

Birmingham. — November 25th. Electric motors (various), for the City Electric Supply Department. See "Official Notices" to-day.

Dover.—November 18th. Two centrifugal pumps, with electric motors, for the Corporation baths. Mr. W. C. Hawke, Borough Engineer, Maison Dieu House, Biggin Street.

Greenock.—November 18th. One 3,000-KW. three-phase turbo-alternator, with condensing plant, &c., for the Corporation. See "Official Notices" November 1st.

Hull.—November 20th. Electric lighting, fittings and bells, for the Teachers' Training College, Cottingham Road, for the Education Committee. Particulars (deposit £1 1s.) from the City Treasurer, Guildhall, Hull. Drawings to be seen at the Education Offices, Albion Street.

November 13th.—Best South Yorkshire screened hard steam coal (1,000 tons), South Yorkshire double screened hard nuts (3,000 tons), and unwashed slack, for the Corporation electricity works. Mr. H. Bell, Electrical Engineer, Sculcoates Lane.

Italy.—Vicenza.—November 12th. International tenders are invited for the supply of an electrically-worked hydraulic press, also of a wheel-riveting machine, for the State Railway workshops at Vicenza. Particulars of the Direzione Generale delle Ferrovie dello Stato, Rome.

Carrara.—Tenders are required for the supply of an electric crane for the Carrara Railway Station. Particulars of the Direzione Generale delle Ferrovie dello Stato, Rome.

Keighley.—November 11th. One 2,000-KW. steam turbo-alternator, for the Corporation. See "Official Notices" October 25th.

London.—L.C.C.—November 13th. Electric lighting installation at the Ricardo Street School, Poplar. See "Official Notices" November 1st.

November 19th.—Electric lighting, bells and telephones, at the "Strand" School, Brixton Hill, S.W., and electric lighting at the Southern Outfall Works, Crossness, Abbey Wood. See "Official Notices" to-day.

Manchester.—November 19th. The Corporation Tramways Committee is inviting tenders for (*a*) tramway rail bonds; (*b*) block tin: (*c*) karri or jarrah wood paving blocks. Specifications, &c., J. M. McElroy, General Manager.

Manchester. — November 19th. One 650-800-KW. rotary converter and transformer, for the City Electricity Committee. See "Official Notices" to-day.

Newcastle-on-Tyne.—November 13th. Stores, including incandescent lamps and arc lamp carbons, for the Tyne Improvement Commission. The Engineer, Clarendon House, Clayton Street West.

New Zealand.—December 16th. Two 150-B.H.P. Diesel engines, two 100-KW. dynamos, balancer, motor-generator, switchboard, crane and oil tanks for Miramar (Town Clerk). Deposit £200. Board of Trade Commercial Intelligence Department, London, E.C.

December 30th.—The Napier B.C. is inviting tenders for two motor-driven centrifugal pumps, of British manufacture only. Commercial Intelligence Branch, Board of Trade, 73, Basinghall Street, E.C.

Rawtenstall.—November 15th. Lancashire boiler, with superheater and mechanical stokers, for the Corporation Electricity Department. See "Official Notices" November 1st.

Rotherham.—November 13th. Electrical installation at the Kimberworth Higher Standard and Infants' Schools, for the Education Committee. See "Official Notices" to-day.

Roumania.—The municipal authorities of Targu-Ocna (Bacau) are inviting tenders until the 25th inst. for the establishment of a central electric lighting station in the town.

South Africa.—The *British and South African Export Gazette* states that orders for electrical machinery, &c., for a lighting and power station to be erected at Winburg, Orange Free State Province, will shortly be on offer. The electrification of the plant of the Susanna mine, Rhodesia, is under consideration, and valuable orders may result shortly.

Spain.—November 18th. Tenders are being invited by the municipal authorities of Calatayud (province of Zaragoza) for the concession for the electric lighting of the town during a period of six years.

Wakefield.—November 9th. Slack and smudge coal, for a year, for the Corporation electricity works. Electrical Engineer, Calder Vale.

Warrington.—November 15th. General stores and permanent-way materials (steel fishplates), for the Cheshire Lines Committee. Specifications obtainable from Stores Superintendent, Cheshire Lines, Warrington.

York.—November 16th. Construction of about 1¼ miles of light railways, for the T.C. Mr. H. Craven, Town Clerk. Returnable deposit of £5.

CLOSED.

Birmingham.—The tender of Mr. Geo. Law, of Kidderminster, amounting to £16,859 for the laying down of the Hagley Road tramway (2¼ miles), and the repaving of a portion of the road, has been accepted by the City Public Works Committee. The Tramways Committee will provide the rails, and Mr. Law the remainder of the plant.

The Electric Supply Committee has accepted the tender of the British Thomson-Houston Co., for two 5,000-KW. turbine sets for the Summer Lane generating station.

Doncaster.—The Tramways Committee has accepted the tender of Mr. J. W. Pearce, of Morecambe, amounting to £2,425 for the extension of the Bentley tramway route to the new colliery village, the rails, fishplates, and bolts, being supplied by the Corporation.

Hanwell.—The U.D.C. has accepted the tender of Messrs. Heenan & Froude, Ltd., for a two-cell refuse destructor, at £1,333.

Horsham.—The U.D.C. has resolved to order a refuse destructor to be erected at the electricity works. Messrs. Heenan and Froude's tender is to be accepted, at £1,450.

Houghton-le-Spring.—For installing the E.L. at the infectious diseases hospital the B.G. has received the following tenders :—

S. Stobart & Co. .. .. (accepted)	£62
Robson & Coleman	125
Falconer, Cross & Co.	123

Leek.—The U.D.C. has accepted the tender of Callender's Cable, &c., Co., at £576, for pilot cable to be laid from the generating station to St. Edward Street.

Liverpool.—The following tenders for special steel rails for the tramways have been accepted by the Corporation :—

Walter Scott, Ltd., Leeds.—2,000 tons of "Sandberg Silicon" rails to Liverpool section (with royalty to Mr. C. Sandberg, of Westminster); and 100 tons "Titanium Alloy" steel rails, Liverpool section.

Llandudno.—The Council has accepted the tender of Messrs. Babcock & Wilcox for a chain-grate mechanical stoker, for the electricity works, at £145.

London.—L.C.C.—The Highways Committee recommended the acceptance of the tender of Messrs. John Batt & Co. (London), Ltd., for 6,000 driving wheel and 5,000 pony wheel steel tires for electric cars (with a guaranteed mileage of 5,000 per ⅛-in. radial reduction), required during 1913, at 22s. each for driving wheel tires, and 18s. 10d. each for pony wheel tires. The firm were to be allowed to sublet their manufacture to the Vereinigte Stahlwerke van der Zypen und Wissener Eisenhütten, Cologne, and to Gutehoffnungschütte Actienverein für Bergbau und Hüttenbetrieb, Oberhausen, Germany. When the matter came before the Council on Tuesday, the recommendation was referred back, with a suggestion that the contract should be placed with a firm who would carry out the work in England.

Maidenhead.—The T.C. has accepted the offer of the Diesel Engine Co., Ltd., to supply a 220-KW. Carels slow-speed Diesel engine and dynamo, at £2,600, the company to take the salvage of the recently-damaged engine and dynamo. The Council has also purchased from the Piggott Electrical Co., of London, a Willans & Robinson 150-KW. steam engine and General Electric Co.'s dynamo (lately in use at Wigan).

Manchester.—Mr. George Ellison has received the contract for the 12 months' supply of "Drum" type "Star-Delta" starters required by the Corporation electricity supply department.

Simla.—A contract has been given to Messrs. F. & C. Osler, Ltd., of Calcutta, for a Rees-Roturbo turbine pump for 1,310-ft. head, direct-coupled to a 230-B H.P. Siemens motor, together with all control gear, for the Cherot Nala pumping station of the Simla waterworks.—*Indian and Eastern Engineer.*

Stafford.—The T.C. has accepted the tender of Messrs. J. Wooldridge & Son for 2,500 tons of Littleton slack and 500 tons of Littleton steam nuts for the electricity works.

Stoke-on-Trent.—The B.C. has accepted the tender of the Bastian Meter Co., Ltd., for 2½, 5 and 10-amp. meters.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—LIEUT.-COL. H. M. LEAF.

The following orders have been issued for the current week :—

Monday, November 11th.—"A" Company. Company training, 7 to 10 p.m.

Tuesday, November 12th.—"B" Company. Recruits' instruction, 7 to 10 p.m. company instruction, 7 to 10 p.m.

Thursday, November 14th.—"C" Company. Company training, 7 to 10 p.m.

Friday, November 15th.—"D" Company. Recruits' instruction, 7 to 10 p.m.; company instruction, 7 to 10 p.m.

Saturday, November 9th.—Headquarters will be opened from 10 a.m. till 12 noon for the transaction of regimental business.

(Signed) P. H. CAMPBELL, Capt. R.E., and Adjt.,
For Officer commanding L.E.E.

FORTHCOMING EVENTS.

Institution of Electrical Engineers (Newcastle Section).—Friday, November 8th. At 7 p.m. At the Lit. and Phil., Middlesbrough. Paper on "The Variation of Loss with Speed," by Prof. W. M. Thornton.
Monday, November 11th.—At 7.30 p.m. At the Armstrong College, Newcastle. Paper on "The Variation of Loss with Speed," by Prof. W. M. Thornton.

Physical Society.—Friday, November 8th. At 8 p.m. At the Imperial College of Science, South Kensington. Papers on "A Method of Measuring the Thomson Effect," by Mr. H. R. Nettleton; "An Improved Joule Radiometer and its Applications," by Mr. F. W. Jordan; and "The Thermomagnetic Study of Steel," by Dr. S. W. J. Smith.

Junior Institution of Engineers.—Friday, November 8th. At 89, Victoria Street, S.W. Paper on "The Diesel Engine," by Mr. J. W. Wainwright.
Wednesday, November 13th.—At 7 p.m. At the I.E.E. Annual general meeting.

Institution of Post Office Electrical Engineers (Metropolitan Centre).—Monday, November 11th. At 6 p.m. At the I.E.E. Paper on "Alternate-Current Measurement," by Mr. C. E. Hay.

Institution of Electrical Engineers (Scottish Section).—Tuesday, November 12th. At 8 p.m. At 207, Bath Street, Glasgow. Opening meeting. Inaugural address by Mr. Wm. M'Whirter, chairman.

Institution of Electrical Engineers (Birmingham Section).—Wednesday, November 13th. At 7.30 p.m. At the University, Birmingham. Opening meeting. Inaugural address by Mr. A. M. Taylor, chairman.

Institution of Electrical Engineers (Dublin Section).—Thursday, November 14th. At 8 p.m. At the Royal College of Science, Dublin. Paper on "The Equipment of the Electro-Technological Laboratories of the Royal College of Science, Dublin," by Prof. W. Brown.

Institution of Electrical Engineers (London).—Thursday, November 14th. At 8 p.m. Opening meeting. Address by Mr. W. Duddell, president. Presentation of premiums.

Association of Mining Electrical Engineers (West of Scotland Branch).—Saturday, November 16th. At 4.30 p.m. Meeting at the Royal Technical College, Glasgow.

NOTES.

The Ferrantians.—The date for the second dinner of past and present Ferrantians has been fixed for Wednesday, November 13th, at Waldorf Hotel, Aldwych, London. Mr. A. Bruce Anderson will occupy the chair, and Mr. S. Z. de Ferranti will be the principal guest. Ferrantians, who have not yet signified their intention of being present, should communicate at once with the hon. secretary, Mr. W. E. Warrilow, 40, Mildred Avenue, Watford.

Curious Workmen's Compensation Case.—According to the *Daily Mail*, William Daws, farm labourer, was at Newark County Court on Monday, awarded 8s. 3d. a week compensation from his employers, Messrs. Harrison, of Grantham, for injuries received by being struck by lightning while on a cart holding a forkful of hay. An electrician said that standing on the cart with the fork raised, the plaintiff constituted a natural lightning conductor. The judge held that the plaintiff was exposed to a special risk, and that, therefore, the accident arose out of his employment.

German Safety Lamp Competition.—The Verein für die Bergbaulichen Interessen, of Dortmund, is offering a prize valued at £1,250 for a miner's electric lamp provided with a reliable fire-damp indicator. The lamp and indicator must be safe against fire-damp even after damage, and after running at least 12 hours, must possess a lighting power of at least one Hefner candle. The prize will be awarded by a board, and may be divided if more than one suitable lamp is submitted, or may be awarded in part to lamps which more nearly fulfil the stipulated conditions. Three lamps, with drawings, descriptions and directions in triplicate (in German) are to be forwarded to the Verein at Dortmund by October 1st, 1913.

Ventilating and Heating Systems.—In a letter to the *Times* of November 1st, on the ventilation of the House of Commons, Prof. J. B. Lock gives some interesting particulars of experiments that have been carried out at Cambridge during recent years in connection with the heating and ventilation of large lecture rooms and halls. Various systems have been tried, and have led to the conclusion that a crowded room should not be warmed by heated air; the fresh air supplied for breathing should be cooler than the air in the room, and the room should be warmed by other means. A large hall seating 1,000 persons is heated with hot-water radiators near the walls at the floor level, and fresh air is introduced by a fan through two rows of gratings 8 or 9 ft. above the floor level; an exhaust fan withdraws the air through openings in the ceiling. Two years' observation has established the fact that the cooler the fresh air sent in, the pleasanter is the atmosphere in the hall; when the hall is full it is difficult to obtain air cool enough, even when the outside temperature is 40° F., and the installation of ice coolers is under consideration.

In the case of laboratories warmed by hot air, which is passed over heating pipes, the oppression and discomfort experienced by the occupants are much greater when steam-heating pipes are used than in the case of hot-water pipes, and it appears that "cooking" fresh air destroys its invigorating qualities.

Consulting Engineer Wanted.—The Nenagh (Ireland) Urban District Council has been inviting applications for the position of a consulting electrical engineer, "at a bulk sum," for the preparation of plans and estimates of the cost of an electric lighting scheme. "Applications to be lodged not later than 8 p.m. Wednesday, November 6th."

Institution and Lecture Notes.—Institution of Electrical Engineers (Birmingham Section).—The chairman of the Section (Mr. A. M. Taylor) will deliver his address on 13th inst. Other fixtures before Christmas include:—November 27th, Mr. J. S. Peck on "Earthed *v.* Un-earthed Neutrals on Three-phase A.C. Systems"; December 4th, Messrs. J. G. and R. G. Cunliffe, on "Street Railway Feeding Networks." The following are the prospective arrangements thereafter:—

G. Kapp, D.Eng., "On the Improvement of the Power Factor in Asynchronous Machinery."

T. F. Wall, D.Sc., "The Circle Diagram for Synchronous Motors."

A. R. Everest, "Parallel Operation of Alternators."

J. P. Wilmshurst, "Electrical Power, Heating and Cooking."

J. Sayers, "Wireless Telegraphy."

E. B. Wedmore, "Protective Switch-Gear."

W. E. Milns, "The Economical Use of Electric Power."

W. F. Bolton and L. D. Morphew, "Recent Developments of Railless Electric Traction."

Institution of Electrical Engineers (Manchester Section).—The opening meeting of the above Section was held on Friday evening last week. The reading of Mr. Day's inaugural address by Prof. Marchant was followed by a smoking concert, which was arranged by Mr. W. J. Smith, hon. musical director of the Manchester Electro-Harmonic Society. The entertainment was very much appreciated by those present. Vocal items were contributed by Mr. A. J. Holt and Mr. G. H. Ditchburn, of the Manchester Cathedral Choir, and Mr. H. Albiston Gee gave some admirable humorous selections.

Physical Society.—At the meeting on October 25th, 1912, a paper entitled "Note on the Mutual Inductance of Two Coaxial Circular Currents," by Prof. H. Nagaoka, was read by Dr. A. Russell. Methods were given for the rapid calculation of the mutual inductance of two coaxial circular currents. A paper on "The Absorption of Gases in Vacuum Tubes" was read by Mr. S. E. Hill, giving an account of experiments carried out to determine whether the absorption of gases caused by passing a discharge for some time through vacuum tubes was the result of a chemical action or a mere physical absorption. The conclusion was that the disappearance was due to definite chemical action.

Institution of Electrical Engineers (Western Section).—The reading of Mr. Chamen's inaugural address at Cardiff on Monday, November 18th (at 4.30 p.m.) is to be followed by a dinner at the Park Hotel at 6.15 p.m. (tickets, 5s. each). The secretary of the Section is Mr. S. B. Haslam, 11, Windsor Place, Cardiff.

Institution of Municipal Engineers.—A joint Southern and South-Eastern district meeting will be held in the Council Chamber, 4, Southampton Row, London, W.C., on Wednesday, November 27th, at 8 o'clock, when a paper on "The Effect of Recent Decisions upon the Arbitration Clause," by Mr. W. Valentine Ball, M.A., barrister-at-law, will be read.

Royal Institution.—The Christmas course of juvenile lectures will be delivered this year by Prof. Sir James Dewar, F.R.S., Fullerian Professor of Chemistry, the title being "Christmas Lecture Epilogues." The lectures will be experimentally illustrated, and the subjects are as follows: "Alchemy," Saturday, December 28th; "Atoms," December 31st; "Light," January 2nd, 1913; "Clouds," January 4th; "Meteorites," January 7th; "Frozen Worlds," January 9th. The lecture hour is 3 o'clock.

Society of Engineers (Inc.).—At a meeting of the Society on the 4th inst., Mr. William P. Durtnall read a paper on "The Generation and Electrical Transmission of Power for Marine Transportation." The "Paragon" system of electrical propulsion was described in detail, and it was shown that this method met all the requirements which had been laid down as necessary for an efficient motive force for driving ships' propellers.

Institution of Electrical Engineers (Dublin Section).—The first meeting of this Section will take place at the Royal College of Science, Dublin, on Thursday next, November 14th, for a paper by Prof. W. Brown, B.Sc., as stated in our "Forthcoming Events." Other fixtures announced by the Section are:—January 9th, 1913, Mr. J. P. Tierney on "Notes on Self-Propelled Cars for Light Railway Work;" March 13th, "Recent Developments in the Application of Electricity to the Textile Trades," by Mr. S. F. Crowley. For December 12th, February 13th, April 10th and May 8th papers are wanted.

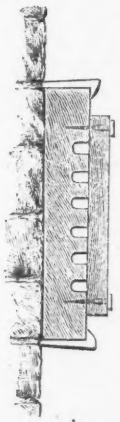
The Brush Supplies Department.—It is announced that the business of the Brush Electrical Engineering Co., Ltd., in electrical apparatus, which has been carried out by the company's supplies department at 1, Kingsway, London, W.C., has now been transferred to the Victoria Works premises, London, S.E., where there is much larger office accommodation and immediate access to the company's stores. Further, in order to avoid the loss of time through the direction of correspondence to the Brush works at Loughborough and the central London office, it has been decided to give a more distinctive title to the department, viz., the London Electric Warehouse Co. The department has already been installed at the warehouse in Manners Street, York Road, London, S.E., and all inquiries relating to lamps, fans, heaters, wires and cables, and accessories, &c., should be so addressed.

A Curious Failure.—Occasionally accidents occur which are not without their use in warning engineers of the pitfalls into which they may fall, and the following example of breakdown of a hydro-electric generating set used for the supply of a gold mine is a case in point. The exciter was fixed on an extension of the main generating shaft, the armature overhanging from one of the main bearings, and the field carcass being bolted to the side of this bearing pedestal. It was discovered on one occasion, after a long period of working, that the generator could not obtain any field, owing to the fact that the exciter, which was of the shunt-wound type, could not be got to excite itself when the main set was started up from rest. This occasioned a good deal of perplexity, until at last the true cause of the difficulty was discovered. It proved to be due to the fact that the main bearing of the generating set had gradually worn and allowed the shaft to drop through a distance which, although inconsiderable as regarded the clearance on the main machine, was quite sufficient to disturb the working of the exciter, owing to the displacement of the armature mounted on the end of the main shaft with relation to the field. Owing to this cause, the armature had been let down so as almost to touch the bottom pole-piece, and was therefore a good distance away from the top pole. The course adopted was to take off the pole-pieces and adjust them by means of liners until the clearance was the same all round, as ascertained by feelers in the air-gap. When this had been done and the machine was started up again, it was found that the exciter picked up its field without difficulty, and the generator was excited up to full voltage without any further trouble.

Copper.—Considering the uneasy state of the money market during the past month, copper has maintained a very steady position. The European visible supplies, as shown by Messrs. Merton's circular, dropped during October by 1,604 tons. Of this, 1,172 tons were withdrawn from English ports, the stocks in Havre decreased 661 tons, and in Hamburg 946 tons. Against this there are larger quantities afloat from Chile and Australia, and an increase in the stocks at Rotterdam.

Supplies from North America to Europe were rather below the average. Spain and Portugal only contributed 685 tons, the usual quantity being from 1,200 to 3,000 tons. This refers, however, to England and France only, the supply from these sources to other countries being high. Chilean shipments were well over the average, and Australian the same. The total deliveries were decidedly good under the circumstances, at 37,216 tons, an increase over those for last month. American visible supplies increased during September by 7,306 tons, a very considerable quantity in a total of 28,158 tons (end of September). The world's visible supplies stood at 76,100 tons at the end of September, an increase of 4,919 tons over the preceding month.

Wood Casing for Electrical Conductors.—Mr. Edward Vigers, the well-known architect, has been kind enough to furnish us with some interesting particulars of the use of wood casing for electrical conductors exactly 50 years ago. He claims, and we have little doubt that he is right, that this is the first instance of their use. In 1862 Mr. Spagnoletti, the consulting electrician to the Great Western Railway Co., and the inventor of the special electrical block signalling system which was to be used on the Metropolitan Railway, then under construction, wanted a protection for his insulated electric wires from the dampness of the tunnel. He applied to Mr. Vigers's father, whose sawmills were on the site of the present Edgware Road Station, for a suggestion and a price. Even in those days price ruled! Mr. Edward Vigers himself made



the drawing, and he has been good enough to furnish us with a sketch, which we reproduce, showing the section of the casing. The casing was of yellow deal, 9 in. × 1½ in. in section, with six grooves, measuring ⅝ in. wide × ⅝ in. deep, for the reception of the insulated wires. The wooden cover to the casing was 7 in. broad × ⅞ in. thick, and was fixed by square-headed coach screws. A special bit with a square sinking to fit the head of the coach screws was used in the same stock that was used for boring the holes. The casing was fixed to the wall of the tunnel by dog spikes driven into the joints of the brickwork. The whole of the woodwork was creosoted before fixing. The design was approved by Mr. Spagnoletti, and the casing was first installed for the protection of the wires from Bishop's Road to Farringdon Street, and afterwards in the extensions of the Metropolitan Railway.

(*Continued on page* 753.)

WILLIAM DU BOIS DUDDELL, President of the I.E.E.

It will be no easy task for the new President of the Institution of Electrical Engineers to live up to the reputation achieved by Mr. Ferranti, but it would be difficult to find in the profession a representative more worthy than Mr. Duddell on whom the mantle of Elijah should descend. To a pioneer and inventor of the first rank succeeds an inventor and discoverer of hardly less eminence. We may look forward with confidence to Mr. Duddell upholding with dignity the record created by past presidents, and may congratulate ourselves that the profession can still produce engineers of such distinction to hold the highest office and receive the greatest honour that it can offer.

Mr. Duddell was born in London in 1872, and has therefore attained his present office at the early age of 40. After a general education in England and France, he served his apprenticeship with Messrs. Davey, Paxman & Co., of Colchester, from 1890 to 1893. From then until 1900 he took special courses at the Central Technical College, whilst there obtaining first a Whitworth Exhibition in 1896 and then a Whitworth Scholarship in the next year. While Mr. Duddell was there, the Central Technical College was perhaps at the height of its reputation; the four brilliant professors who had created it were still guiding its course, and the changes brought about by its incorporation with the University of London had not yet arrived to tend to cause it to lose its individuality. Mr. Duddell had the advantage of working under the late Prof. Ayrton, and he would probably be the first to admit that it was Prof. Ayrton's inspiration and guidance that largely influenced the direction of his own work. It was whilst at the College that Mr. Duddell laid the foundations of his reputation.

Photo by] [*Lafayette, Ltd.*

W. Duddell, F.R.S.

In 1898 he read, in conjunction with Dr. Marchant, now Professor at Liverpool University, the paper on "Experiments on Alternate Current Arcs by Aid of Oscillographs," which is in many ways characteristic of the nature of much of his later work. Mr. Duddell and Dr. Marchant had set out to investigate the characteristics of the alternate-current arc, and had found it necessary to construct a new instrument for their purpose. To this end Mr. Duddell was able to bring not only knowledge and originality in instrument design, but a mechanical ability which enabled him to construct instruments of extreme delicacy entirely by his own handiwork. The research produced two results. First, an exhaustive examination into the properties of the alternating arc, and, second, a new instrument of great delicacy and power which has since proved of the highest utility in numerous branches of electrical engineering, and has won several Gold Medals at International Exhibitions. Those who remember the reading of this paper before the Institution will not readily forget the extreme beauty of the demonstration given, and will appreciate it more when they remember that the instruments used were entirely of Mr. Duddell's own construction. The double trend which we see indicated in this first paper of importance published by Mr. Duddell has been pursued in his later work. On the one hand, he has added largely to the number of instruments available for the electrical engineer in his work, succeeding in producing instruments which satisfy the purpose for which they are required, as much by his ability to test the result of his own calculations as by his power of design itself. On the other hand, genius for investigation, for experimentation, and for pursuing a problem until it is cleared up, has led him to the publication of many important researches, and to the carrying out of equally important investigations which, for various reasons, have not been published.

Notably, we may refer to the paper on "Rapid Variations of Current Through the Direct-Current Arc," which Mr. Duddell presented to the Institution in 1900. The paper dealt with what was a side issue in a more elaborate research, the discovery of the means of producing rapid alternating currents by shunting the direct-current arc with capacity and self-induction. The musical arc which Mr. Duddell showed on this occasion was then no more than a curiosity, but it has since become the basis of one of the most important of the systems of wireless telegraphy. Later, Mr. Duddell read before the Royal Society, of which he is a Fellow, his paper on "The Resistance and E.M.Fs. of the Electric Arc," which is the fullest solution that has so far been put forward for this exceptionally intricate problem.

To his scientific activities Mr. Duddell has always added a keen and active interest in the doings and welfare of scientific societies. In 1908 he held the office of vice-president of the Physical Society, and has since then acted as hon. treasurer to that Society. In 1907 he was president of the Röntgen Society. In 1905 he was elected

a member of the Council of the Institution on which he had previously served as an Associate Member of the Council in 1901. In addition to these offices he acted in 1904 as hon. secretary to the delegates to the International Congress at St. Louis, and in 1908 as one of the secretaries to the International Conference on Electrical Units and Standards. We cannot, however, name here all the duties of this kind which Mr. Duddell has undertaken, but merely quote these as evidence that his outlook is not confined to scientific and engineering research itself. He has always been active in any movement which tends to benefit our profession, and the keenness which he has shown to undertake work of this description may render us all confident that the interests of our Institution and profession will be safe in his hands during his term of Presidency.

THE CHAIRMEN OF THE LOCAL SECTIONS OF THE I.E.E.

To **Mr. A. A. Day, A.M.Inst.C.E., M.I.E.E.,** the chairman of the **Manchester Section**, and to the Section itself, we extend our sympathy in view of the illness which prevents the former from active participation in the meetings at present. He has been for many years borough electrical engineer and tramway general manager at Bolton, but he has been unable to attend to these duties lately owing to a severe illness, which came on very suddenly. His inaugural address to the Manchester Section was read in his absence by Prof. E. W. Marchant, the vice-chairman, and it appears in abstract elsewhere in this issue. Prof. Marchant said that the members would be pleased to know that Mr. Day was progressing as well as could be expected, and the secretary was asked to send a letter expressing regret at his enforced absence.

Mr. W. C. Mountain, M.I.Mech.E., M.I.M.E., M.I.E.E., the chairman of the **Newcastle-on-Tyne Section,** was born in 1862, and served his apprenticeship as a mechanical engineer with Messrs. May & Mountain, of Birmingham. In 1883 he took up electrical work, being appointed engineer to the Gulcher Light and Power Co. Shortly afterwards he was made general manager, and finally managing director; but he resigned this position at the end of 1888, in order to join Mr. Ernest Scott, of the Close Works, Newcastle-on-Tyne, who was then engaged in the manufacture of marine engines and auxiliary work in connection with warships. Mr. Mountain introduced the electrical department of the business shortly after joining, and finally that department became the principal interest of the firm, who combined the electrical with the mechanical work required in connection with the installation of electrical plant in mines, their specialities comprising three-throw horizontal mining pumps, haulage machinery of the main and tail, main rope and endless rope types, electric winding gears, centrifugal pumps, and also portable three-throw and centrifugal pumps and haulages. He first introduced electricity into mines about 24 years ago at the Cowpen Coal Co.'s North Seaton Colliery, when a large electric pumping installation was installed $1\frac{3}{4}$ miles in-bye. This example was followed later by the Lothian Coal Co. deciding to adopt electric pumping for their new Victoria Pit at Newbattle, the work being carried out to the specification of Mr. John Morison, mining engineer, to whom the credit is given of being the first to recognise the advantages of electricity for main shaft pumping. Afterwards the Hickleton Main Coal Co. installed a large endless-rope haulage, and their lead was followed by the Plas Power Co.

The business of Messrs. Ernest Scott & Mountain, Ltd., developed very rapidly, and became one of the largest in the country, and so continued for some years. Mr. Mountain resigned his position last year in order to take up consulting work, principally in connection with the introduction of electricity in mines, and we understand that he has a very large amount of work in hand at present, being consulting engineer to the Warwickshire Coal Co., Ltd., Houghton Main Colliery, Waleswood Colliery, Walter Scott, Ltd., Bedlington Collieries, Charlaw and Sacriston Collieries, Hemsterley Colliery, and several others.

Mr. Mountain's inaugural address was printed in abstract in our last issue.

Mr. A. M. Taylor, M.I.E.E., is the chairman of the **Birmingham Section** of the Institution. After completing his general education at Bute House School, Richmond, Mr. Taylor passed through the Finsbury Technical College, and consequent upon that, entered the shops of Messrs. Siemens Brothers, Woolwich.

After three years with Messrs. Siemens he was sent out by them on various breakdown jobs and installation works, both at home and on the Continent, and eventually represented them as their engineer in India for three years, during which time he worked out several important town lighting schemes and carried out numerous large installations.

On returning from India, Mr. Taylor still remained with Messrs. Siemens, and was for some time in charge of their traction work. Soon after leaving them he received an appointment in Birmingham under the late city electrical engineer, and prepared the early plans for a large development in the lighting and traction requirements of the city.

When Mr. Chattock went to Birmingham, Mr. Taylor assisted him in the preparation of the very large scheme which he brought forward, and in the drawing up of the specifications, &c., especially in connection with the switchgear at the Summer Lane station and the various substations.

In 1910 Mr. Taylor contributed a paper to the Municipal Electrical Association on the subject of "Batteries for Peak Loads," which directed the attention of engineers to this matter both at home and abroad, and caused more than one engineer to put down such batteries on a large scale. He has also contributed several papers to the Institution of Electrical Engineers, of which, perhaps, the best known is that read a little over a year ago, entitled "Batteries and Battery Discharge Arrangements."

Mr. W. J. U. Sowter, M.I.E.E., chairman of the **Dublin Section,** was born at Margate, and educated there. In 1889 he entered the works of Messrs. S. Z. de Ferranti as a pupil, and went through the shops and testing department, studying also as an evening student at Finsbury Technical College. From 1893 to 1896 he held the appointment of resident engineer at the Lancaster County Asylum, having charge of the steam and electrical plant. From 1896 to 1897 he acted as assistant in the distribution department of the St. James's and Pall Mall Electric Light Co., and from 1897 to 1898 he was mains superintendent with the Aberdeen Corporation. Here he conducted the change in pressure from 220 to 440 volts under Mr. A. S. Blackman, the city electrical engineer. Mr. Sowter's next appointment (1898-1900) was that of assistant engineer to Ealing Corporation, after which he spent some years (1900-1903) as deputy electrical engineer to the Coventry Corporation. In that capacity he carried out the scheme for changing the system over from single-phase 83 cycles to two-phase 50 cycles. He also inaugurated and had charge of the department for hiring motors to consumers. In 1903 Mr. Sowter was selected for the post of borough electrical engineer at Dorchester, which office he held until 1904, when he left for Bray, Ireland, where he was appointed engineer and manager to the Urban District Council. There he has had charge of water, steam and oil generating plant. During the time Mr. Sowter has held the above position he has almost entirely reconstructed the Bray undertaking, an important part of the scheme being the eventual supersession of steam engines by internal-combustion engines. One Diesel set has already been installed, and a second set of 100 KW. is now on order.

As our readers are aware, on July 10th Mr. Sowter met with a serious accident, the cause being the bursting of a compressed-air cylinder connected with the Diesel engine. Unfortunately, while Mr. Sowter's medical advisers are quite satisfied with the progress that he is making, it will be about three months before he is able to get about and resume business. To his own and his fellow members' regret, he has, therefore, been unable to prepare an address as chairman of the Dublin Section, and will be deprived for the present of the pleasure of presiding over the meetings.

Mr. Sowter is the author of papers on "Gas-Producer

Plants for Central Stations," and "The Diesel Engine from the User's Standpoint," both of which were read before the Dublin Local Section. He has acted as consulting engineer to the Larne U.D.C., and other authorities and firms.

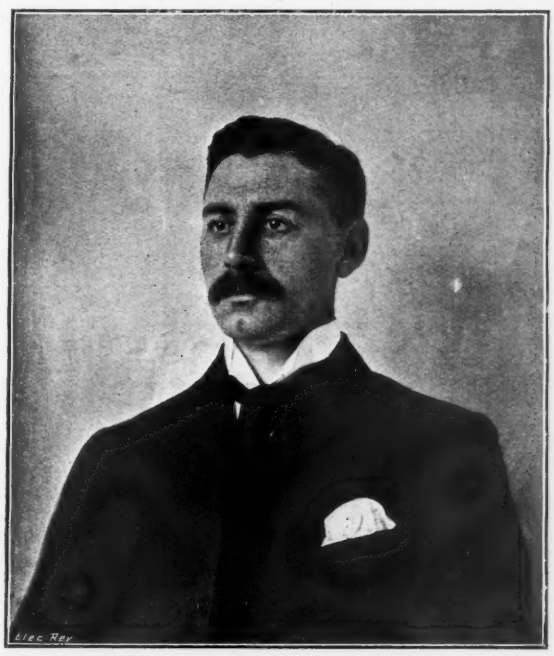
Mr. W. A. Chamen, M.I.E.E., M.I.M.E., the first chairman of the new **Western Section**, was born in London in 1863, and at the age of 18 years he entered the employ of Mr. Crompton, and later took charge of installation work for the firm at home and on the Continent, following with personal supervision of the incandescent electric lighting installation at the Law Courts. He served Messrs. Crompton in these and other capacities, including that of chief outdoor engineer, until in 1898 he took the position of chief engineer to the Glasgow Corporation electricity supply undertaking. Our readers will remember that it was seven years thereafter that Mr. Chamen went to South Wales to tackle the difficult problem of bringing the South Wales Electric Power undertaking through the technical and commercial reorganisation which was inevitable if the system was to be continued. He has maintained his connection with the matter as general manager of the concern (and the Treforest Electrical Consumers' Co., Ltd.) ever since; he also carries on practice as a consulting engineer, with offices in Cardiff. Mr. Chamen during his term as chief of the Glasgow electricity undertaking acted as chairman of the Local Section of the I.E.E., so that he will not be performing unaccustomed duties in presiding over the work of the new Western Section. We hope to hear of very active work in progress in this Section before long. The inaugural address will be delivered on the 18th inst.

Photo by [*N. S. Kay.*

A. A. Day.

Photo by [*Barclay Bros.*

W. C. Mountain.

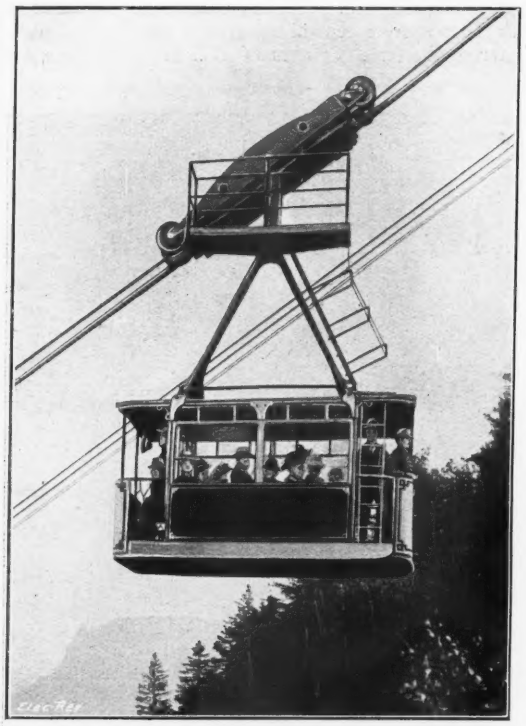


A. M. Taylor.

W. J. U. Sowter.

Chairmen of Some of the Local Sections of the I.E.E.

Mr. S. D. Schofield, M.I.E.E., M.I.Mech.E., who was elected chairman of the **Yorkshire Section,** delivered his address (which appears in abstract on another page) at Leeds on Wednesday evening, but as he is leaving for Norway at once his duties as chairman ceased after that meeting, and Mr. Wilson Hartnell, a former chairman, will again preside over the deliberations of the Section, for the 1912-3 session. Mr. Schofield was born at Guiseley, Yorkshire, and was educated privately and at Bradford Technical College under Dr. Dale and Prof. G. F. Charnock. He served his apprenticeship with Messrs. J. Perry and Sons, Shipley, and afterwards gained experience with Thos. Smith & Sons, Rodley, Leeds; S. Sutcliffe and Sons, Bradford; S. Clayton, gas engineers; Rosling and Matthews, electrical engineers; and Sir Titus Salt, Bart., Sons and Co., Ltd., Saltaire, obtaining an all-round experience of gas, steam and hydraulic engineering and textile machinery. In 1900 Mr. Schofield entered the service of the Shipley Urban District Council as works manager, and in the following year he was appointed resident engineer and manager for electricity supply, refuse destructor, sewage pumping and sewage treatment. He has now resigned his position with the Shipley Council to take up an appointment with the Thelma Syndicate, Ltd., at their copper mines in Norway. We understand that the employés at the works presented Mr. Schofield with a fitted dressing case, and other officials and friends presented him with a cabin trunk, kit bag, and other gifts. He leaves Newcastle to-morrow, November 9th, and after that date his address will be Sulitjelma, Nordland, Norway.



Kohlererberg Cableway; Side View of Car and Carrier.

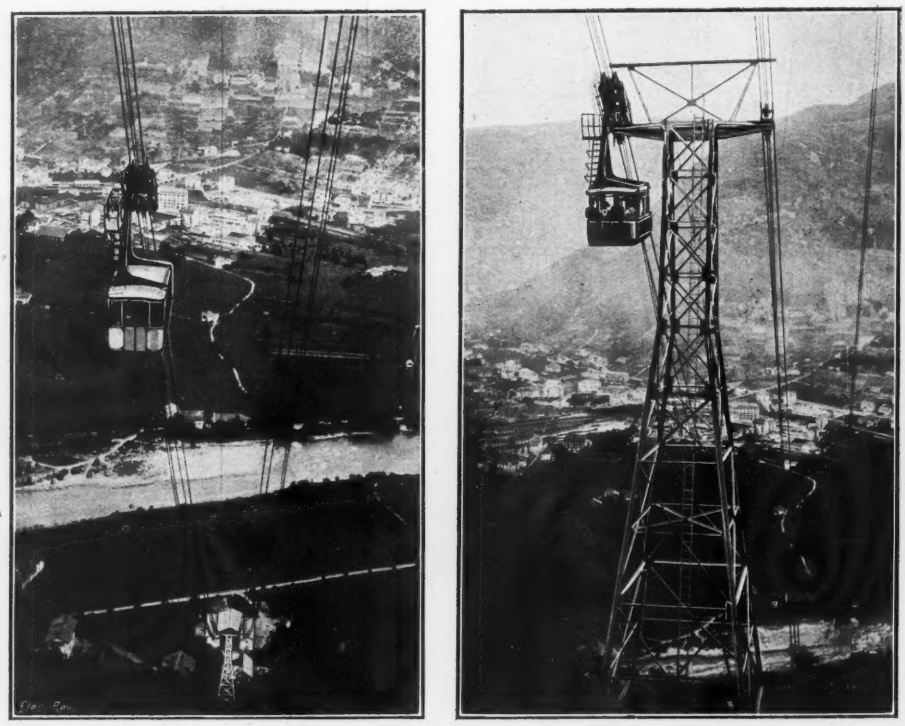
Mr. William McWhirter, M.I.E.E., chairman of the **Scottish Section,** is one of the pioneers of electrical engineering on the Clyde; as long ago as 1880 he was an Associate of the Institution, and in 1883 he became a full Member. Not one of his fellow-chairmen was even an Associate at that date, when electric lighting was only beginning to be seriously regarded, and the dynamo was a very primitive machine. But Mr. McWhirter had confidence in the new industry, and played a leading part in its development in Glasgow, keeping himself abreast of electrical progress in all its branches, and frequently supplying thoughtful and practical contributions to the discussions of the Institution, which has now awarded him the highest honour that the Scottish Section has at its command.

A NEW SUSPENDED RAILWAY IN THE TYROLESE MOUNTAINS.

[BY OUR BERLIN CORRESPONDENT.]

A NEW suspended railway up the Kohlererberg has been installed by Messrs. Adolf Bleichert & Co. Comfortable cars travelling along steel cables rise smoothly and steadily from the Eisack, overcoming in 13 minutes a difference of level of 840 metres, and opening up an ever extending panorama which, among other mountains, comprises the whole of the Ortler range.

The suspension cables, 1,650 metres in length, are carried by 12 substantial iron supports. Two cars, each accommodating, in addition to the driver, 15 passengers, are operated simultaneously in opposite directions, going uphill



Views on the Kohlererberg Cableway

and downhill respectively. Each car is suspended from a travelling gear which is carried by eight pulleys on two steel cables 44 mm. in diameter. The suspension of the cars is pendulous, any oscillations of the car body being damped by a brake, while the carrying cables take part in any oscillations at right angles to the track, so that there is no risk of derailment.

Each car is hauled by two traction cables operated from a driving station alongside of the line. As both the traction and carrying cables are duplicated, the safety required for a passenger service is fully ensured.

It is interesting to note what further safety devices have been provided to protect passengers against any risk of breakdown. Into the travelling gear of the cars have been fitted two self-contained braking or catching devices, which are operated automatically as soon as a carrying cable or one or both of the traction cables are broken or the normal maximum speed is exceeded. These devices can also be actuated by the driver, being released by a simple manipulation. As soon as the catching device is operated, steel jaws firmly grip the carrying cables at eight different points, maintaining the car in position with absolute safety by the friction thus produced. At the same time the electric supply to the driving motor is stopped, and the brake of the latter is actuated.

This suspended railway is operated by electricity. As a buffer battery is provided at the driving station in parallel with the main generators, operation can be kept up for hours in the event of a breakdown of the latter. Should a car, however, in the event of a breakdown of the driving gear be stopped on the open track, an emergency capstan would (if a single traction cable were left uninjured) allow of its being hauled into the station. Furthermore, there is at each station an emergency car for fetching any passengers left on the open track, and, finally, each car is provided with a special device, a kind of bag with a floor, which, being lowered through the car bottom, allows passengers in cases of emergency to get safely to the ground. As the rope carrying this bag passes through a brake, any dangerous increase in speed is guarded against.

The driving stations likewise are provided with various safety devices. At each driving station there is a mechanic, who commands a ready view of the track ; there are, further, two brakes automatically operated in the event of a breakdown or actuated by hand. The upper and lower stations communicate with one another by telephones and electric signals. The cars cannot be started before the stations have communicated by optical and acoustical signals, or before these signals have been confirmed. Furthermore, there is a telephone line arranged alongside of the track, by means of which the driver, from any point of the line, can communicate with the terminal stations.

NOTES.

(*Continued from page 748.*)

Marconi Libel Action.—Reuter states that a libel action has been brought by Mr. Marconi and Mr. Godfrey Isaacs, a director of the Marconi Co., against Alfred Scholz, the responsible editor of *Die Welt am Montag*, in Berlin. The paper declared that at the time of the *Titanic* disaster Mr. Marconi permitted his company to exploit the catastrophe for selfish ends, and stated that the operators in the *Carpathia* withheld news in order that the company might thereby profit. Counsel for the defendant announced that the defence would maintain all the charges made. The hearing was postponed for the production of the American Senate Commission's report, as it is alleged that Mr. Marconi admitted before that Commission that he withheld news for three days. It was also decided to examine the chief telegraphist of the *Carpathia*, Mr. Cortham, either personally or by commission. Mr. Bride, the wireless operator on the *Titanic*, is also a witness. The allegation of the defence is that Mr. Marconi withheld news in order to sell it to the *New York Times* for a large sum.

A Birmingham Exhibition.—It is stated that a 10 weeks' exhibition is to be opened in March next at Bingley Hall, Birmingham, among the features of which will be displays of gas and electrical illumination for industrial and domestic purposes, cookery lectures and demonstrations.

Appointment Vacant. — Clerk of Works, for the Hackney B.C. electricity works extension (£4 4s.). See our advertisement pages in this issue.

Electricity Supply Rifle League.—The following are the results of the matches shot during September and October in connection with the above League:—Central (Wells 96) 541 *v.* Hackney (Self, Smith 95) 540 ; Ilford (McKelvey 99) 553 *v.* Hackney (Self 93) 536 ; Shoreditch (East 98) 553 *v.* Ilford (Brown 98) 566 ; Shoreditch (Weeks 98) 573 *v.* Central (Greenwood 99) 563 ; Shoreditch (Weeks 98) 566 *v.* Hackney (Self 97) 548 ; Stepney (Young 97) 559 *v.* Hackney (Smith 96) 549 ; Westminster (H. A. Pearman 96) 562 *v.* Hackney (Hilling 98) 541.

POSITION OF CLUBS TO DATE.

	Shot.	Won.	Lost.	Drawn.	Points.	For.	Against.
Westminster ..	6	6	0	0	12	3,408	3,276
Shoreditch ..	8	5	3	0	10	4,474	4,402
Central	7	5	2	0	10	3,887	3,848
Stepney	6	2	3	1	5	3,268	3,320
Ilford	7	2	5	0	4	3,760	3,872
Hackney	10	1	8	1	3	5,426	5,503

Electrical Workers' Demands.—The *Daily Citizen* states that an application for an advance of ½d. per hour in wages is being made by the Clyde district of the Electrical Trades Union, "and as the men are thoroughly organised, they have every hope of the concession being granted. Twelve months ago the Glasgow branch of the Union was split up into three branches, and as the central branch also has grown very rapidly, there is a proposal to take similar action with it."

Fatalities.—The *Daily Express* reports that on Tuesday Mr. J. C. M. Thompson, solicitor, was killed by electric shock while taking an electric bath at an establishment in Cavendish Place, W. He had previously taken baths for rheumatism, and went to the baths apparently in good health, with the idea of having a bath as a tonic. While he was in the bath, and the electric current was turned on, the man who regulated it heard the telephone bell ring, and left the bathroom to answer the call. A few moments later he heard a cry, and, running back to the bathroom, found Mr. Thompson dead. It is understood that Mr. Thompson touched the electric regulating handle with his foot while he was still in the bath, and, as the water in which he lay was charged with electricity, the contact somehow completed a circuit. An inquest was to be held yesterday.

A few weeks ago a woman died in an electric bath in the same district, but the cause of death was not definitely ascertained.

A correspondent states that a fatality occurred at the Manchester Corporation generating station, Stuart Street, at 1 o'clock on Wednesday morning, resulting in the death of Wm. Henry Pickwell (24). It appears that Pickwell was assisting a man named Willis to repair a switchboard, which had been allowed to become "dead" for the purpose. He was going round the switchboard, which was one of the ordinary ones used to supply the tramway and general services of the city, when he put his hand on a live wire. He was killed instantly ; the pressure was over 3,000 volts. Artificial respiration was tried at once without avail.

Electrically-Driven Cogging Mill.—We understand that the electrically-operated 28-in. reversing cogging mill at Messrs. Dorman, Long & Co.'s Britannia Works, Middlesbrough, to which we referred in our account of the I.M.E.A. Convention in June last, is operating to the entire satisfaction of the management. The electrical equipment consists of a mill motor of 1,200-3,600 H.P. at 70-120 R.P.M., directly connected to the rolls, and supplied with direct current at 0-440 volts by a fly-wheel equaliser set. The motor of this set is fed from a 2,750-volt 40-cycle three-phase supply, and is mounted on the same base-plate as and directly coupled to a generator rated at 1,000-3,000 KW. The speed of the set is 480 R.P.M., and the fly-wheel, which weighs 33 tons, and is 11 ft. in diameter, runs in its own bearings, and is connected to the generator by a special compression-type flexible coupling.

The plant has proved itself capable of outputs considerably in excess of the guarantees given by the makers (the British Thomson-Houston Co., Ltd., Rugby), and in practice the mill motor is subject to overloads greatly in excess of the maximum rating given above. It has not been found necessary to give any special attention to the commutators of the D.C. machines, in order to ensure satisfactory operation. That of the mill motor has not been ground or trued up in any way since its installation, and the commutation of the generator is sparkless, although more than two years have elapsed since the commutator was ground up. These results clearly show that electrical machinery is perfectly capable of tackling even so difficult a proposition as a large reversing mill with success.

Some Notes on Aluminium.—To blacken aluminium alloys, immerse the article in a boiling hot solution of caustic soda of 30 per cent. strength, for a few seconds ; wash off the excess of caustic, dry in sawdust, and polish with a plumbagoed brush. When blackening pure aluminium by means of the usual ferrous sulphate, arsenious oxide, and hydrochloric acid mixture, the deposit is non-adhesive ; the addition of an ample proportion of ammonium molybdate and yellow prussiate of potash gives a solution, in which the article, dipped and kept for a few minutes at boiling temperature, becomes coated with a permanent black. Aluminium is to a certain extent acted on by ammoniacal vapour ; in the case where copper is present, in contact with it, the preferential action of the ammonia on the copper preserves the aluminium from attack. To solder aluminium, Richard's solder—tin 69, zinc 26·2, aluminium 24, 5 per cent. phosphor-tin 2·4 parts—is a useful material. To cover the appearance of application of solder, the ordinary aluminium paint is quite suitable.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials. — The Liverpool City Council at the final meeting of the municipal year, on October 29th, formally approved the appointment of MR. HAROLD DICKINSON, as city electrical engineer, at a salary of £1,000 per annum, increasing to £1,500 by such increments of not less than £100 per year as may be from time to time decided by the Tramways and Electricity Committee.

The position of MR. ALFRED CLOUGH, resident electrical engineer, was also considered on the following recommendation:—"That, in view of the appointment of a chief electrical engineer, the Tramways and Electricity Committee be authorised to arrange for the retirement of Mr. Clough, at such date as may be mutually agreed, and that in the special circumstances of the case a superannuation allowance, equal to one-half of his present salary, be paid to him from the date of his retirement, and the difference between the amount of such allowance, and the amount of the superannuation to which the resident electrical engineer would be otherwise entitled, be paid out of the revenue of the electric supply undertaking." Ald. Fredk. Smith, in moving the adoption of the recommendation, pointed out that Mr. Clough was at an age when it was desirable that he should take things a little easier, and it had been thought advisable on the appointment of a new man to retain Mr. Clough's services for one or two years, or until the new man had got thoroughly into harness. An amendment was moved by Mr. Hickling to have the matter of superannuation referred back for a report by the controller giving a proper return of the actual service of Mr. Clough and the amount of the pension to which he was entitled in the proper course. Sir Charles Petrie (chairman of the Committee), in resisting the amendment, explained that Mr. Clough entered the Corporation service when it took over the electrical undertaking some 16 years ago. The amount of superannuation to which he was entitled was £352, and in 12 months' time he would be entitled to £374. Mr. Clough had been of very valuable service, and the gentlemen who wished to pose as economists in the Council ought to see that it was but justice that he should get the amount proposed. The amendment was withdrawn, and after further discussion, the recommendation was confirmed.

Shipley U.D.C. has appointed MR. J. P. ROBSON, senior shift engineer, at the Colne Corporation electricity works, as assistant electrical engineer.

On the occasion of his wedding, MR. HENRY LISTER, shift engineer at the Close power station of the Newcastle and District Electric Lighting Co., Ltd., was presented with a technical work on the "Steam Turbine," together with a fountain pen and a slide rule, by members of the staff. Mr. Lister leaves England for Melbourne to-day, 8th inst.

At a dinner given to the employés and their wives by MR. WM. SILLERY, burgh electrical engineer, Partick, and EX-BAILIE JACKSON, convener of the Electricity Committee, in the Whiteinch Burgh Hall, on Monday, 28th ult., Mr. Sillery was made the recipient of a gold hunting lever watch, as a token of esteem, from the employés and friends, while Mrs. Sillery was presented with a gold pendant set with pearls and amethysts. In making the presentation, Ex-Bailie Jackson spoke in eulogistic terms of the good qualities and capabilities of Mr. Sillery, and gave details of the progress the station had made since Mr. Sillery took up office in 1907. Mr. Sillery replied, thanking the employés and friends on behalf of Mrs. Sillery and himself. During the evening a number of the employés of the department rendered a programme of music and song.

MR. STANLEY POLLOCK, on leaving the service of the Aberdeen Corporation electricity department for an appointment at Broughty Ferry electricity works, was presented with a purse of sovereigns.

The salary of MR. H. P. STOKES, borough electrical engineer and tramways manager of Ilkeston, has been increased at the rate of £15 per annum.

MR. H. J. JACKSON, of the Salford Corporation electricity department, has been appointed to the position of canvasser to the Cheltenham Corporation electricity department.

MR. J. WILLIAMS, assistant electrical engineer to the Rotherham undertaking, is to have his salary increased from £175 to £187 per annum, with a further advance of £12 10s. at the expiration of 12 months.

MR. N. C. ROWAN has resigned his position with the Cleveland and Durham Electric Power, Ltd., having been appointed assistant engineer to the River Plate Electricity Co., Ltd.

General.—On October 30th, MR. H. B. MITCHELL, who has resigned his post as shift engineer at the Grimesthorpe Works of Messrs. Cammell, Laird & Co., Ltd., Sheffield (having been appointed electrical engineer to the French Society of Copper Mines, Chile), was the recipient of a cabin trunk and vacuum flask from the staff of the electrical department. The presentation was made by Mr. H. West, chief electrical engineer. Mr. Mitchell expects to leave England during this month.

MR. ARTHUR H. JEANS informs us that he has now severed his connection with the General Electric Co., Ltd. (for the last five years in charge of the Robertson lamp department), and he is now representing Messrs. Pope's Electric Lamp Co., Ltd., for the London district.

An inquest was held last week into the death of MR. R. M. BARLEY, aged 49, a canvasser in the Islington municipal electricity department, who was knocked down by a motor-bus in Upper Street and died as the result of injuries received.

The *Indian and Eastern Engineer* states that by the retirement of MR. E. J. LOPEZ, after over 46 years' service, the Indian telegraph department loses one of its most distinguished officials. "Mr. Lopez is the inventor of several systems of telegraphy which have proved of great technical and commercial value."

The *Times* announces that the President of the Board of Trade has appointed MR. G. T. MILNE to be His Majesty's Trade Commissioner for the Commonwealth of Australia, in succession to Mr. C. Hamilton Wickes, who, as our readers know, is now in Canada. "Mr. Milne is at present completing an inquiry on behalf of the Advisory Committee to the Board of Trade on Commercial Intelligence into the conditions and prospects of British trade in Central America, and will proceed to Australia early next year."

MR. P. S. BROOK, electrical engineer, has been re-elected a member of Chester City Council.

MR. HAROLD BENTHAM, manager since 1902 for the Birkdale Electric Supply Co., Ltd., has accepted a position under the Electrical Federation of the Birmingham and Midland Joint Committee. Mr. Bentham's successor at Birkdale is MR. G. L. KIRK, of the staff of the Sheerness and District Electric Power and Tramways Co.

COUNCILLOR JAMES HEALD, electrical engineer, Lancaster, and chairman of the Lancaster Corporation Electricity Committee, has been returned by a large majority in the municipal elections.

The General Purposes Committee of the L.C.C. recommends the promotion of MR. G. W. HUMPHREYS, M.I.C.E., the present deputy chief engineer of the Council, to be chief engineer and county surveyor, at a salary of £2,000.

Consequent upon the resignation of MR. BERNARD HOLLAND from the L.C.C. Special Committee on London Electricity Supply, it is recommended that MR. R. C. NORMAN be appointed a member.

MR. FRED. S. SELLS, for the past 10 years manager of the Manchester branch of the General Electric Co., Ltd., has just returned from a trip to South America, where he has completed the work entailed in connection with the formation of the Anglo-Argentine General Electric Co., Ltd., and has also improved the organisation of the company's interests in Brazil. In addition to resuming his former work, Mr. Sells has accepted a seat on the board of the General Electric Co., Ltd.—this having been offered to him some few months ago in recognition of his long and useful services to the company.

MESSRS. P. L. DWYER and P. R. WINTERSON, late with the Armorduct Manufacturing Co., Ltd., have commenced business as wholesale electrical supplies agents, under the title of P. L. Dwyer and Co., at 66, Victoria Street, S.W. Mr. Dwyer was presented with a gold watch by Mr. Marchant (secretary) on behalf of the London office staff, on the occasion of his relinquishing the post of London sales manager to the Armorduct Co.

Obituary.—We regret to hear of the death of MR. CECIL BURMAN CALLOW, of Messrs. Kohler Bros., which took place at North Side, Clapham Common, London, on 31st ult., at the age of 47 years.

We desire to express our sympathy with MR. SAMUEL LEES, of the Stretford (Manchester) Electricity Works, on the death of his wife, which occurred on October 29th, after prolonged suffering.

The death has taken place at Rhyl of MR. EVAN MEREDITH EVANS, senior partner in the firm of E. M. Evans & Son, electrical engineers, of Manchester and Oswestry. He was 71 years of age.

NEW COMPANIES REGISTERED.

J. W. Middleton & Co., Ltd. (125,044).—This company was registered on October 29th, with a capital of £3,000 in 1,990 ordinary shares of £1 each and 200 management shares of 1s. each, to carry on the business of manufacturers of and dealers in electric light fittings, metal workers, electrical and mechanical engineers and contractors, manufacturers of and dealers in electric, magnetic, galvanic and other apparatus, &c., and to adopt an agreement with H. M. Burr, J. E. Barber, W. F. Merry and C. W. Brown, trading as J. W. Middleton & Co., at 147, Wardour Street, W. The subscribers (with one share each) are:—W. F. Merry, 38, Florence Road, Wimbledon, S.W., art metal worker; H. W. Burr, 22, Ravenscourt Gardens, Hammersmith, W., art metal worker; J. E. Barber, 54, Browneker Road, South Acton, art metal worker; C. W. Brown, 339A, Hither Green Lane, Hither Green, S.E., traveller. Private company. The first directors are W. F. Merry and R. M. Aldred (nominees of vendors), B. S. Miller (chairman) and E. J. Beard (nominees of Miller & Sons). Two directors are to be nominated by the vendors, H. M. Burr, J. E. Barber, W. F. Merry and C. W. Brown, and two by Miller & Sons; qualification, £25 ordinary or 25 management shares. Remuneration as fixed by the company. Registered office, 147, Wardour Street, W.

Dublin Southern District Electric Supply Co., Ltd. (3,900). Registered in Dublin on October 31st, with a capital of £40,000 in £1 shares, to carry on the business of electrical engineers, electricians, practical engineers and contractors, carriers of passengers and goods, manufacturers of electric apparatus, &c. The subscribers (with 50 shares each) are:—W. M. Murphy, 39, Dame Street, Dublin, civil engineer; W. A. Evans, 27, Longford Terrace, Monkstown, insurance and mortgage broker; G. V. Murphy, 7, Anglesea Street, Dublin, commission agent. Private company. The first directors are W. M. Murphy, W. A. Evans and G. V. Murphy; qualification, 50 shares; remuneration as fixed by the company. Registered office, 16, College Green, Dublin.

Russian Wireless Telegraph Trust, Ltd. (125,014).—Registered October 26th, by A. Benjamin & Cohen, College Hill Chambers, College Hill, E.C. Capital, £100 in £1 shares. Objects, to purchase, or otherwise acquire, sell, hold, issue, dispose of, deal in and generally turn to account any shares, scrip or other securities of, or interests in, any company, society, corporation, association or firm engaged in, or carrying on, in the Empire of Russia or any other foreign country or State, or in the United Kingdom, or any Colony, State, Province or Dependency thereof, the business of telegraphy and telephony, whether wireless or otherwise; in particular (but without restricting the generality of the foregoing powers), to so acquire, dispose of and turn to account any shares, stocks, bonds or other securities of a company incorporated under the laws of Russia, and known as the "Société Russe de Telegraphiques et Telephones Sans Fil"; to lay down, equip, maintain and work telegraphs and telephones, or other means of communication, and to carry on in any part of the world the business of wireless or other telegraphy in all branches (but so that the company may not carry on wireless or other telegraph or telephone business in the United Kingdom without the sanction of the Postmaster-General, except so far as it may lawfully carry on the said business without such consent); to generate, accumulate, supply and distribute electricity, electrical energy or other power or force for lighting, heating, communication, traction, motive power, industrial and other purposes, and whether for public or private use, &c. The signatories (with one share each) are:—T. M. Norris, 25, Ingersoll Road, Uxbridge Road, W., secretary of a private company; A. E. Lees, 2, Livingstone Road, Palmer's Green, N., director of companies. The company is a private one within the meaning of the Companies' (Consolidation) Act, 1908, and accordingly (*a*) the number of members (exclusive of employés) is not to exceed 50; (*b*) no invitation may be made to the public to subscribe for any shares, debentures or debenture stock of the company; (*c*) no share warrant to bearer may be issued unless the company shall first have complied with the provisions of Sec. 121, sub-Sec. 2, so as to turn itself into a public company; and (*d*) the board may, without assigning any reason, decline to register any transfer of shares. The first directors (to number not less than two or more than seven) are to be appointed by the signatories to the memorandum of association. The first directors have power, *inter alia* (*a*), to appoint any person, whether a director or not, to hold in trust for the company any property belonging to the company, or in which the company is interested; (*b*) to appoint any person as the attorney of the directors, with such powers as they think fit, including power to appear before all proper authorities and make all necessary declarations, so as to enable the company's operations to be validly carried on abroad; and (*c*) borrow, raise or secure any moneys and create and issue perpetual or redeemable debentures or debenture stock, or any mortgage or charge on all or part of the company's undertaking or property, present or future, or its uncalled capital. No notice of registered office appears on the file to October 30th.

Commercial Electric Co., Ltd. (125,000).—This company was registered on October 26th, with a capital of £5,000 in £1 shares, to take over the business of an electrician, mechanical engineer and manufacturer carried on by J. H. Kloet, at 18, King Street East, Manchester, and elsewhere, as the Commercial Electric Co. The subscribers (with one share each) are:—J. H. Kloet, 29, Tatton Road, North Heaton Moor, Stockport, electrical engineer; E. Oldfield, 3, Stockton Road, Chorlton-cum-Hardy, electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are J. H. Kloet, managing director, and E. Oldfield; qualification, £50; solicitor, J. A. Orrell, 18, St. Ann Street, Manchester. Registered by Waterlow & Sons, Ltd., London Wall, E.C.

G. H. Turner & Co., Ltd. (125,025).—This company was registered on October 28th, with a capital of £1,500 in £1 shares (500 preference), to take over the business of electrical engineers carried on at 2, High Street, Willesden Junction, N.W., and at 41, Cheapside, E.C., as G. & H. Turner and G. H. Turner & Co., together with certain assets and liabilities, and to carry on the same and the business of motor-car, motor and other cycle manufacturers, agents or dealers, &c. The subscribers (with one share each) are:—G. A. Turner, 2, High Street, Willesden Junction, N.W., electrical engineer; A. Green, 5, Moorgate Street Buildings, E.C., chartered accountant. Private company. The number of directors is not to be more than three; G. A. Turner is first managing director; qualification, 100 preference shares; remuneration of G. A. Turner, £25 per annum, together with an additional £3 per week for his services as managing director. Registered by A. H. Green, 5, Moorgate Street Buildings, E.C.

Armature Repairing and Supply Co., Ltd. (125,060).—This company was registered on October 30th, with a capital of £500 in £1 shares, to carry on the business of electrical engineers and manufacturers of and dealers in all kinds of electrical plant, machinery, instruments, &c. The subscribers (with 10 shares each) are:—J. Forrester, 20, Glanmor Crescent, Swansea, electrical engineer; W. Mitchell, 21, Victoria Terrace, Swansea, electrician. Private company. The first directors are J. Forrester and W. Mitchell. Solicitor, R. F. Gee, Llanfair Chambers, St. Mary Street, Swansea. Registered by Jordan & Sons, Ltd., 116-7, Chancery Lane, W.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Egham and Staines Electricity Co., Ltd.—Particulars of £12,000 debentures, created September 25th, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908; the amount of the present issue being £11,000. Property charged: The company's undertaking and property, present and future, including uncalled capital and debts due to the company. No trustees.

Anglo-Argentine Tramways Co., Ltd.—Acknowledgment of indebtedness dated October 18th, 1912, supplemental to trust deed dated June 15th, 1910, to secure £1,500,000 5 per cent. debenture stock, ranking, *pari passu*, with £3,000,000 similar stock secured by principal deed, charged on the company's undertaking and property, present and future, including uncalled capital subject to charge dated January 9th, 1905, securing £71,060, reducible to £70,660, charges dated June 2nd, 1908, and January 22nd, 1909, securing £4,465,674 5 per cent. debenture stock and indenture dated July 1st, 1909, securing £1,733,380 4½ per cent. debenture stock. Trustees: Law Debenture Corporation, Ltd., 41, Threadneedle Street, E.C.

Mexican Fuel and Power Co., Ltd.—Particulars of £5,000 debentures, created September 24th, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £1,050. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

E. Brook, Ltd.—Debenture dated October 18th, 1912, to secure £3,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: G. V. Laycock, 146, Poplar Villas, Halifax.

Direct West India Cable Co., Ltd. (53,956).—Return dated September 19th, 1912. Capital £120,000 in £5 shares. 12,000 shares taken up. £2 10s. per share called up on 12,000. £30,000 paid. Mortgages and charges: £22,000.

Electrical and Engineering Supplies Co., Ltd. (99,423).—Return dated August 27th, 1912. Capital, £1,000 in 950 preferred ordinary shares of £1 each and 1,000 founders' shares of 1s. each. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Jandus Arc Lamp and Electric Co., Ltd. (43,898).—Return dated September 10th (filed September 26th), 1912. Capital £30,000 in £10 shares; 2,041 shares taken up; £5 per share called up on 1,195, and £10 per share on 250; £8,475 paid; £5,960 considered as paid on 596 shares. Mortgages and charges: £2,629 15s. 6d.

W. Sisson & Co., Ltd. (82,295).—Return dated October 17th, 1912. Capital, £25,000 in £1 shares (5,000 pref., 13,000 ord. and 7,000 def.). 3,375 pref., 11,701 ord. and 7,000 def. shares taken up. £1 per share called up on 3,375 pref. and 6,251 ord. £9,626 paid. £12,450 considered as paid on remainder. Mortgages and charges: £4,186 17s. 7d. bank overdraft, secured by mortgage on works.

Ridings Arc Lamp Co., Ltd.—Particulars of £5,000 debentures, created October 16th, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908; the whole amount being now issued. Property charged: The company's property, present and future, including uncalled capital. No trustees.

Altrincham Electric Supply, Ltd.—Particulars of £35,000 debentures, created by resolutions of June 7th, 1898, and April 18th and October 3rd, 1912, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £5,000. Property charged: The company's undertaking and property, present and future. No trustees.

CITY NOTES.

La Plata Electric Tramways Co., Ltd.

THE adjourned annual general meeting of the shareholders of the above company was held on Wednesday last at Winchester House, Old Broad Street, E.C., Mr. W. F. Hamilton, K.C., in the chair.

The CHAIRMAN, in proposing the adoption of the report, devoted the major portion of his speech to an explanation of the defalcations which were referred to in the report. In the course of his remarks, he said that when he left England, it was estimated that the amount of the defalcations by their accountant was about £1,000, and it was not until some little time after he had landed in the country that he ascertained them to amount to a little over £10,000. Their accountant came to them with a good character, and he had a good reputation, but the defalcations would not have been possible had their local auditors, Messrs. Fowler, Scroggie & Co., done their duty, or had their late manager himself checked the monthly cash balances. Mr. Dawe, their manager, of course, had implicit confidence in Mr. Allen, the accountant and the auditor. Having personally investigated the accounts, he (the chairman) had no hesitation in advising the board that the local auditors were legally liable in damages to the company for breach of duty as auditors, and an action had been commenced for the purpose of enforcing that liability. Under those circumstances, he refrained from saying anything more about Messrs. Fowler & Co., except to mention that they were the auditors of the old horse tramway company, and that at the time the board appointed them local auditors for this company they were acting in the same capacity for many well-known companies carrying on business in the Argentine, and had a good reputation as accountants. As they knew, he (Mr. Hamilton) was entrusted by the board with full powers to take such steps as he thought necessary to prevent a recurrence of such defalcations. It was suggested that a local board, consisting of three members, should be appointed, but he did not think that was the best course to pursue. What was really needed was a reliable and capable manager solely responsible to the board for the working and management of the tramways, skilled and reliable auditors, with a local representative. As to the latter, they could not have a better representative than the gentleman who at present acted for them in that capacity—Mr. Boutell—for besides being a considerable shareholder, he took a great interest in the company. Mr. Dawe, their manager, had resigned just before he (the speaker) arrived on the spot, having been appointed traffic manager to another company, and the board, upon his (Mr. Hamilton's) recommendation, appointed Mr. Valentine Brown in his place, and he was satisfied that Mr. Brown was exceptionally well qualified for the position. It was with some concern that the board observed that the receipts for this year showed for some months a falling-off, while at the same time the ratio of expenses had increased, thus reducing the profits. The principal cause of that decrease was the wet weather and the interference with traffic caused by the paving works and the completion of the electrification of their competitors' lines. The weather had, however, improved since August. Various alterations were made by him in consultation with the manager, with the view of reducing working expenses and obtaining increased receipts. Their new manager was a very capable man, with large experience of the working of tramway systems, and there were reasonable grounds for anticipating a progressive increase in their net profits not only on the Ensenada section but also in the city of La Plata. They would be glad to hear that their traffic receipts for October were £5,007, as compared with £4,060 for the same month last year. That was an increase of nearly £1,000 for the month. He stated at the last annual meeting that it would be necessary to make an issue of debenture stock some time this year to provide for the extra expenditure incurred in buying additional rolling stock, doubling their car-shed accommodation, taking up and relaying the track rendered necessary by the new paving works, and paying the difference between the amount allowed for electrifying their old Ensenada horse tramway, and the amount expended on their longer and better new Ensenada route. As they might imagine, owing to the war in the Near East and the high bank rate and their losses by defalcations, the board had found it impossible to issue the stock except at a considerable loss. The stock was only to be offered to their shareholders,

so that they would save the cost of a public issue. They had found it necessary to issue the stock at 90, and to have it underwritten at 2½ per cent. They intended to issue £70,000 of this debenture stock, making in addition to the £30,000 already issued, £100,000. They had spent £196,000 already on the electrification and equipment of their line, so that the security offered to the shareholders was ample. In conclusion, the chairman said that much as they regretted their losses by embezzlement, it was to be remembered that the earning capacity of the line was not in any way diminished. He had given them as full information as he possibly could, and he confidently expected that at the next annual meeting they would find that the growth in their receipts and the diminution in their expenses which they anticipated, would be realised.

MR. W. T. WESTERN seconded the motion.

A somewhat lengthy discussion ensued, in which several shareholders suggested that the board had been remiss in not seeing that they had a banker's certificate from the Argentine every month.

The CHAIRMAN, in reply to the criticisms, said that they got every month from the other side a balance-sheet, which was certified by the auditors as being correct, and also certified by the manager. They also received correct copies of the accounts. If the accounts had been kept in the same way in the cash book at La Plata as they were kept in the accounts sent to them, it would have been all right: but as it was, they were deceived, and it was impossible for them to have known that these frauds were going on. He quite agreed that the ideal, and it was that at which they were now aiming, was to have the London auditors responsible to them for the audit in the Argentine, so that if anything went wrong, they would not have to resort to the local auditors. The board now got a regular banker's certificate each month. In conclusion, the Chairman said that personally he felt extremely sorry to have to record such a lamentable state of affairs, and as far as he and his colleagues on the board were blameable, they took the blame, but he still said that if the local auditors had done their duty, the defalcations would never have occurred.

The report was then adopted.

Cuba Submarine Telegraph Co., Ltd.

THE eighty-second ordinary general meeting of the shareholders of the above company was held on Wednesday, at 58, Old Broad Street, E.C., Mr. George Keith presiding.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW, page 714), said the traffic for the past six months had been more favourable than last year. They would see by the report that they had had to sell some of their securities to pay for a new cable. The total receipts for the six months were £23,721, being £2,947 better than last year. The London expenses had not increased, but those of the stations had largely increased. The depreciation of stores and stock amounted to £300. Of the total profit £4,000 had been placed to general reserve, £2,000 to reserve against loss on investments, and £2,000 to establish a pension fund for their employés. The general reserve fund now stood at £92,000. The dividend on the preference shares was £3,000, leaving £12,542, out of which the directors recommended the payment of a dividend of 6 per cent. on the ordinary shares. The cables of the company were in excellent working condition, and the shareholders would be pleased to know that the traffic receipts up to the present compared well with the same period last year. Subject to the approval of the shareholders, the directors had considered the advisability of forming a pension fund for their employés, and giving them a pension for long service. The pension system had been adopted by nearly all telegraph companies, and it was of vast importance to the company that they should have such a fund. The principal feature of the fund was that when an employé left the company at the age of 60 he would receive a pension if he had served 20 years with the company. No pension would exceed £200 a year. The scheme when it was in full working order would not cost the company more than from £400 to £500 for the half-year.

MR. CHARLES W. PARISH seconded the motion, and the report was adopted.

Amazon Telegraph Co., Ltd.—The directors' report for the year ended June 30th, 1912, states that the gross revenue was £104,444, and the working expenses were £51,199. After providing £15,000 for debenture interest and carrying £15,000 to the general reserve and £12,000 to the reserve for the renewal and maintenance of cable steamers, the directors recommend a dividend of 4½ per cent., free of income-tax, on the share capital, leaving £5,664 to be carried forward. The s.s. *Ramos*, the new small steamer specially built for repairing the company's cables in the shallow side waters of the river, was completed early this year and despatched to the Amazon in June last, and arrived safely under her own steam. The annual meeting is called for November 18th.

R. & J. Dick, Ltd.—After paying the preference dividend, the directors proposed to carry forward £4,199. The year's results showed improvement over those of the previous 12 months.

Stock Exchange Notices.—Applications have been made to the Committee (1) to appoint a special settling day in and to grant a quotation to:—Anglo-Argentine Tramways Co., Ltd.—Scrip fully and partly paid for a further issue of £1,500,000 5 per cent debenture stock.

West India and Panama Telegraph Co., Ltd.

THE meeting of this company was held on Wednesday at Winchester House, E.C., Mr. W. B. Kingsford presiding.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW, page 713), said that the total revenue for the half-year amounted to £46,718, being £600 less than for the corresponding period in 1911. The traffic receipts were £486 less, which accounted for the greater part of the net loss of £600. The expenditure was £1,780 more than for the June half of 1911, having amounted to £27,109, against £25,329. During the half-year under review, 42 knots of cable were used in repairing and renewing the two Porto Rico sections, which had been charged to the reserve fund. Nearly the whole of the extra outlay during the half-year was incurred by the repairing ship, the *Henry Holmes*, chiefly in connection with the repairing operations. Including the time spent on the Porto Rico repairs, the *Henry Holmes* was engaged in cable work for 120 days in all, against 75 days in the corresponding half-year. Having given an account of the various cables owned by the company, the chairman said that, as a result of the half-year, the directors were able to add £2,000 to the reserve fund, and to recommend the same dividend on the ordinary shares as a year ago, carrying forward £2,791. As to the receipts for the current half-year, he might mention that, according to the cable returns brought down to the end of October, there had been a falling off of £367, as compared with the corresponding four months of last year.

MR. HENRY HOLMES seconded the motion, which, after a short discussion, was adopted.

Eastern Telegraph Co., Ltd.—The directors' report that for the six months ended June 30th, 1912, the revenue amounted to £746,710, from which are deducted £261,490 for the ordinary expenses, and £44,597 for expenditure relating to maintenance of cables, sundry differences in exchange, and income-tax payable abroad, leaving a balance of £440,623, plus £23,882 brought from the preceding account, making a total available balance of £464,505. After providing for income-tax payable in England, interest on mortgage debenture stock, and for two quarterly dividends on the preference stock, which in all absorb £82,087, there remains a balance of £382,418, out of which the directors have placed £230,000 to the general reserve fund, and have allocated £100,000 to meet the two interim dividends of 1¼ per cent. each on the ordinary stock, the balance of £52,418 being carried forward. The meeting is called for November 13th.

Continental.—BELGIUM.—Le Syndicat de Signaux pour Chemins de Fer, of Brussels, reports a profit of £1,365 for the last financial year.

FRANCE.—A company has just been formed in Paris (48, Rue Richer), with a capital of £12,000, and the title La Société de la Lampe Philips.

RUSSIA.—The Russian A.E.G. Co., of St. Petersburg, owing to the increasing business, is raising its capital from 8 to 12 million roubles.

Western Telegraph Co., Ltd.—The directors recommend a final dividend of 3s. per share, making 6 per cent. for the year ended June 30th, and a bonus of 2s. per share.

Buenos Ayres Tramways Co. (1904), Ltd.—The directors have declared a dividend of 1s. 3d. per share (5 per cent. per annum), less income-tax, for the three months ended September 30th.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—The directors' report states (says the *Financier*) that the gross receipts for the half-year to June 30th amounted to £367,785, against £329,709 for the corresponding half-year of 1911. The working expenses, including £28,452 for maintenance of cables, absorb £166,232, against £151,618 for the corresponding period of 1911, leaving a balance of £201,552. From this is deducted £3,648 for income-tax, payable in England, and £15,048 for interest on debenture stock, leaving £182,855 as the net profit for the half year. After adding £23,829 brought forward there is an available balance of £206,684. Two quarterly interim dividends of 1¼ per cent. each, amounting to £75,000, have been paid for the half-year, leaving £131,684, from which £75,000 has been transferred to the general reserve fund, and the balance of £56,684 is carried forward.

Hong Kong Tramway Co., Ltd.—An interim dividend at the rate of 5 per cent. per annum is announced for the six months ended June 30th.

Western Union Telegraph Co.—The report states (says the *Financier*) that the accounts for the year to June 30th shows gross earnings amounting to $41,661,400, while expenses, including taxes, absorbed $36,063,800, leaving a balance of $5,597,600, making with $1,326,400 in respect of income from loan and investments, together with rentals from real estate, a credit balance of $6,924,000. Bond interest has absorbed $1,670,400, a sum of $1,250,000 has been written off against repairs and reconstruction of landlines, while dividends amounting to $2,991,800, or 3 per cent., have been paid, leaving a surplus of $1,011,700. The gross earnings from the company's telegraphs and cables during the past year show an increase of $6,182,000, while the expansion in landline message tolls was $4,357,373, or 15·57 per cent.

Barbados Electric Supply Corporation, Ltd.

THE directors report that the results for the year ended June, 1912, are not considered unsatisfactory. The revenue derived from supply was naturally very small during the early part of the financial year, when few consumers were connected to the mains. The total income from that source during the six months to the end of December was less than half the income during the following six months, to June 30th, 1912. Revenue charges, on the other hand, are for a full normal year's working. The number of consumers connected to the mains at June 30th, 1912, was 247, as compared with about 100 at the close of the half-year to December 31st, 1911. Since the close of the year under review, the company has been successful in obtaining a contract for a portion of the public lighting of Bridgetown. Capital expenditure during the year, amounting £3,167, represents principally the supply and part erection of a storage tank for oil fuel, the completion of the construction contracts and expenditure for house services and connections. Further expenditure has already been authorised in connection with the public lighting contract, and for the extension of the mains into districts from which it is anticipated a reasonable revenue may be obtained. To provide additional working capital, a temporary loan of £3,000 was arranged in the early part of the financial year. Since the close of the accounts, and in connection with the additional capital expenditure referred to above, a loan of £10,000, secured by an issue of debentures, has been raised, the previous loan of £3,000 having been repaid out of the proceeds. In March, 1912, Mr. Gerald H. J. Hooghwinkel was elected a director of the company. Mr. Leslie Whittem Hawkins has resigned his seat on the board, and does not seek re-election.

The second annual general meeting was held on October 31st, at Basildon House, E.C., Mr. A. W. Tait presiding.

The CHAIRMAN, in moving the adoption of the above report, said that at the last general meeting, the shareholders were informed that supply was only commenced at the beginning of July, 1911, also that the construction as originally planned was not completed until the middle of September, 1911. Very little progress in the way of wiring premises was made during the period of construction, as the residents would not enter into definite contracts with them until the business was a going concern. Consequently, when they were in a position to supply, they had few customers. Nevertheless, those few scattered consumers necessitated the generation of current considerably in excess of what they actually required. They would see from the report that at the end of the first six months about 100 consumers were connected, the number of lamps being roughly about 1,100, the total equivalent of 25-C.P. lamps, including motors and fans, being at that date about 1,700. At the end of the year, viz., on June 30th last, the number of consumers was 247, the lamps connected 2,857, and the total equivalent of 25-C.P. lamps, including motors and fans, &c., 5,201. It was true that those figures were not up to the estimate of 4,000 lamps for lighting purposes only, mentioned at their last meeting, but several reasons could be advanced for that. The principal reason was the difficulty they had so far experienced in completing installations quickly. There were no outside wiring contractors in Barbados, and consequently all the installations had to be done by the company. That necessitated the training of men for the work, but as the wiring business was naturally very brisk at the start, their staff of trained men was really inadequate. That difficulty had already disappeared to a certain extent, and they hoped to encourage local tradesmen to take up the business of wiring and fitting, in order that consumers could be connected quickly to the company's mains. They also had to face the competition of the gas company, a very keen competition at the present time. In fact, they were led to believe, by the reduction the gas company had made, and the terms on which they sometimes supplied fittings, that the advent of electric light was seriously felt by them. But the keener the efforts of the gas company to secure new business became, the more sure might they be that they were making progress. The shareholders might be interested to know the corresponding figures to those given above for the period which had elapsed since the close of the year under review. The only figures available were for the months of July and August. During those two months, 27 new consumers had been connected, the additional number of lamps being 345. Another 2-H.P. motor and some fans, &c., brought the total additional equivalent of 25-C.P. lamps connected during the two months to 472. Since the close of the year they had succeeded in securing a contract for an extension of the public lighting of Bridgetown. That was important for the company in two ways; firstly, from the important point of view of the revenue to be derived from the contract, and secondly, because of the continual public advertisement which such public lighting afforded. They were convinced that many residents would be persuaded to adopt electric light when they saw it in the streets. The contract was equivalent to an addition to the mains of 360 25-C.P. lamps. They were hopeful that, in time, that contract would lead to a still larger contract for public lighting. They were gradually securing a number of consumers for power purposes also. The installations of that nature were mostly small. Motors for a total capacity of 77 H.P. were connected at June 30th—that compared with 25 H.P. at the close of the half year. A further total of 36 H.P. had been ordered during the current year. The profit and loss account showed a loss on trading for the year of £467d. That was made up of a loss on the supply of power, less profit on installation. Dealing with the revenue from sale of power, that had been considerably lower than should have been the case if they based their calculations of consumption per lamp on home experience. The time of the year, however, when their installations were few, was really the season which should have shown them the best results. Other causes had also contributed to the low consumption. The residents in Barbados were, he understood, noted for the early hour at which they retired but with the prospect of better lighted streets, and, perhaps, electric tramways, they might look in the future for later hours, and a consequently greater demand for light. The expenses during the year were stated in the report to have been for a full normal year's working. That did not mean that they had reached the highest level to which expenses might mount, but they might appreciate the force of the statement when it was pointed out that double the current could have been sold without, possibly, a penny increase in the expenses. Local administration and general expenses could not vary very much. The only other heavy revenue charge was for power expenses, and it was not anticipated that that would increase materially during the present year, as last year's account had had to bear the cost of experimenting with different classes of oil fuel. They were still paying a high price for that fuel, but it was hoped that in time they might be able to get a better supply at cheaper rates. They hoped to be in a position when submitting the accounts for the current year to report a small profit, but although the directors had every confidence in the future of the undertaking they wished the shareholders to appreciate that progress would not be so rapid as was originally anticipated. With the acquisition of the Barbados Tramways Co. by an American syndicate, and the granting of a concession for electrifying the system, they had hoped to come to arrangements with the syndicate for the supply of the power required. Negotiations had been carried on for some time with the parties interested, but they had not yet made up their mind what policy they intended to adopt, and it was probable that they might have difficulties under their concession unless they decided at an early date what they proposed to do. The balance-sheet showed that a further 1,503 preferred shares had been issued during the year. Those represented a portion of the amount agreed to be subscribed for by contractors in respect of construction work. A still further amount would be issued in a similar way during the current year, when a final settlement was made with the contractors and retention moneys paid. The item of £3,000 loan which was appearing in the balance-sheet was explained at the last general meeting. The report told them that that loan had been paid off since June 30th, and a new loan of £10,000 secured by an issue of debentures had been raised. The rate of interest was 7 per cent., and they had the power under the debentures to raise a further £5,000 on similar terms should it become necessary. The additional moneys were required for the extensions and the supply of fittings necessary for the public lighting, the laying of further mains on the road to Hastings and St. Lawrence, a district which was rapidly developing, and in other directions. The extension of the mains for public lighting would naturally secure for them other consumers in the districts where the mains were laid.

MR. W. F. LEESE seconded the motion, and the report was adopted.

Perth Electric Tramways, Ltd.

AN extraordinary general meeting of the above company was held at the offices of the London Chamber of Commerce, Oxford Court, E.C., on Friday last, under the chairmanship of Mr. Oliver Wethered, for the consideration of two resolutions. The first resolution provided that subject to the second resolution being passed, the provisional agreement dated May 23rd, 1912, and made between the company of the one part and the Hon. Sir Newton James Moore on behalf of the Government of Western Australia of the other part, providing for the sale of the company's tramways and part of its other property to that Government, be approved, and that the directors of the company be authorised to carry the same into effect. The second resolution provided for the alteration of the Articles of Association so that on the completion of the sale and the winding up of the affairs of the company, the remaining assets should be applied as follows:—First, in repaying to the holders of the preference and ordinary shares of the company the capital paid up on such shares respectively, and subject as aforesaid, one equal tenth part of the balance of such assets to be paid to the directors of the company as remuneration for their services in negotiating the sale, and the remaining nine equal tenth parts of the balance to be distributed among the holders of the preference and ordinary shares *pari passu* in proportion to the amounts paid up on the preference and ordinary shares held by them respectively.

The CHAIRMAN explained that he occupied the chair at the request of the board, as Mr. Stoneham was a very large shareholder, and preferred to be present in his capacity as a shareholder. With regard to the resolutions, he intended to leave the matter entirely to the shareholders, but he ought to tell them that proxies representing 62,233 ordinary shares and 82,515 preference shares had been received in favour of the scheme. He would leave it for some shareholder to propose the resolutions.

MR. BAILEY formally proposed the adoption of the first resolution, and MR. DUDLEY WARD seconded the motion.

MR. FRANCIS said he did not think it was a right thing for the board to have called an informal meeting of the preference shareholders, who had practically arranged for the way in which the ordinary shareholders were to give up their surplus rights. He should have thought that directors of responsibility and honesty would in such a case have conferred with the ordinary shareholders as well. It seemed to him that the whole of the circular was drafted in such a way as to prejudice the position of the ordinary shareholders, for the future of the company had been set out in the

blackest light. The circular said that if the ordinary shareholders did not consent to pay what was practically blackmail, the company was to be carried on in the future for the benefit of the preference shareholders. He approved of the sale of the undertaking, but he considered the proposed division of the assets was preposterous. They knew one of the directors was largely interested in the preference shares, and he did not seem to be content with the honorarium he would get, but wanted his pound of flesh. He believed if the ordinary shareholders who had given proxies knew the truth, they would not have given them.

Mr. Ward: The preference shareholders have found as much capital as the ordinary, and should have an equal voice in the matter.

Mr. Jacobs proposed an amendment in the wording of the first resolution with the object of leaving it open for the directors to amend the second resolution later.

The Chairman said he considered Mr. Francis's remarks as to honesty distinctly offensive, and most uncalled for. The board had done their very utmost to bring about a just position. A week ago the ordinary shares stood at 14s., and they now stood at 24s. or 25s. Such remarks as those made by Mr. Francis were not in the interests of other ordinary shareholders whom he did not represent. The object of the board was to do the best for both classes of shareholders.

Mr. Lock said he represented about 800 preference shares, and attended the meeting of the preference shareholders referred to. The company had been running a considerable time, and they knew what the result had been. In 13 years the ordinary shareholders had received 25 per cent., whilst the preference shareholders had received three times that amount. At the 1911 meeting the chairman referred to a conversation he had had with the Premier of Western Australia, who told Mr. Stoneham frankly that the public in Perth would not allow their means of locomotion to be in the hands of a private company, and that view had been borne out by the fact that the Perth City Council had adopted an obstructive attitude towards the company. Quite recently the Government with great difficulty got a Bill passed for the purchase of the undertaking, and in his judgment the board of the company had shown great skill in negotiating the provisional contract by which they got £475,000 for the property. After paying off the debenture stock, that would permit of the payment of 27s. or 28s. to each class of shareholders. At the 1911 meeting the Chairman told the shareholders that the preference shareholders would not come into the scheme unless they had a substantial inducement to do so, and he also said that considering the small value attaching to the ordinary shares, it would be a fair thing if the interests of the preference shareholders were capitalised on a 4 per cent. basis, or in other words, that the preference shareholders might reasonably expect 30s. per share as an inducement to consenting to give up a valuable investment. Mr. Francis was present at that meeting, and spoke, but he offered no objection to the suggested appropriation. At the informal meeting of the preference shareholders, it was made abundantly clear that they had no desire to sell, but rather than stand up against a good sale they agreed to come in on terms. If the preference shareholders declined to come in, there could be no sale, but the brunt of further obstruction and hostility on the part of the Perth local authority would fall on the ordinary shareholders. If the ordinary shareholders wanted him to come in as a preference shareholder, his figure was that mentioned in the resolution.

Mr. Andrews pointed out that the ordinary shareholders might have received more dividends in the past had further capital been raised, instead of undivided profits having been applied to extensions. He would be quite willing to give the preference shareholders a bonus of 1s. or 2s. a share.

Mr. Ward: At the preference shareholders' meeting you agreed to equal division.

Mr. Andrews said that since then he had had time to reflect. He thought the policy of the preference shareholders was a selfish one. The sale could not take effect yet, and he asked if the board contemplated paying a larger dividend this year. He suggested a dividend of 10 per cent.

The Chairman said they could hardly expect him to discuss what dividends would be paid.

Mr. Jacobs spoke in support of his amendment, and complained that the board had broken their trust in calling the meeting of preference shareholders. He did not say the board had not acted perfectly honestly, but they had been misguided. He considered that 2s. 6d. was sufficient bonus for the preference shareholders and appealed to fair-minded men to accept that compromise. He also pointed out that the preference shareholders could not veto the sale if a sufficient number voted for it.

Mr. Francis seconded the amendment.

Mr. Bailey said he understood that the preference shareholders had certain rights and were determined to exercise them, and he proposed the resolution because he thought they had no power to help themselves. Having heard the discussion, he did sincerely ask the preference shareholders to have some regard for the ordinary shareholders. He had stuck to the ship from the start and had got very small dividends.

Mr. Lock: We are helping you to get a very substantial sum for shares worth 14s.

Mr. Booth, as both an ordinary and preference shareholder, supported the sale, as he did not think Australia offered a good field for them in the present state of public feeling. As a preference shareholder, however, he felt he was squeezing the ordinary shareholders, and he did not think the preference shareholders were standing on a moral basis.

Mr. King asked if the Western Australian Government were not told that the preference shareholders would require about 30s., and was it not on that ground that the company obtained the magnificent sum of £475,000?

Mr. Stoneham (chairman of the company) said the negotiations were very difficult and lasted for weeks. When they commenced, the preference shareholders were in a good position and the ordinary shareholders were in a bad one. Before the meeting in 1911 he saw several of the largest preference shareholders about the matter, and they said they would not sell except on a 4 per cent. basis, which meant 30s. a share, and he told the shareholders of this at the meeting. The offer from the Western Australian Government was a very great deal less than £475,000, and he said it was impossible to accept such a price, for he knew the views of the preference shareholders. It was only by pressing that that he obtained the £475,000 on the distinct understanding that the preference shareholders would get 30s. a share. He approached the preference shareholders, and tried to get them to take a more moderate view, and ultimately they agreed to take the equal share. At that time it looked as if each class of shareholders would get about 25s. a share, but now it looked as if it would be considerably more. They consulted counsel as to procedure, and the resolutions were drafted on the advice of counsel. The circular was an absolutely correct statement of the facts. They had everyone antagonistic to them. The conductors, drivers, the local Council and the Government were all against them. He never minded a fight when there was a chance of success, but to fight against tremendous odds like that was absurd. He held over 10,000 ordinary shares, and speaking as an ordinary shareholder, he would say it was absolute madness to refuse the offer.

Mr. Bailey said that after hearing Mr. Stoneham's remarks, he was perfectly satisfied.

The amendment was rejected by 13 votes to 7, and the resolution was carried by 14 votes to 4.

Mr. King, in proposing the adoption of the second resolution, said that there had been a good deal of ethereal sentiment talked, but they had to look at the question from a business point of view. He doubted whether the receipts of the tramways would continue to increase. They knew the effect of motor-'bus competition on the London tramways, and the threat had been made that the Perth Council would run motor-'buses to depreciate the value of the tramway undertaking.

Mr. Beddow seconded the motion.

Mr. Jacobs again criticised the action of the board in consulting the preference shareholders, and said Mr. Stoneham had gone a long way out of his way in referring to the position of the preference shareholders in his negotiations with the Agent-General.

Mr. Stoneham: The man who conducts a sale has the right to use the best means he can to get the best offer he can. Otherwise I should have got £50,000 less. Instead of criticising me you ought to be jolly thankful.

A further amendment to reduce the price which the preference shareholders would get under the scheme was defeated, and the resolution was carried.

A meeting of the ordinary shareholders was then held, and a similar resolution was proposed.

Mr. Francis moved an amendment to the effect that the preference shareholders be paid 25s., and that the balance of the assets should go to the ordinary shareholders.

This was defeated by 17 votes to 4, and a poll was demanded. The poll was taken immediately, and the amendment was rejected by a considerable majority, and the resolution was carried.

A meeting of the preference shareholders was subsequently held, and the resolution passed.

Norwich Electric Tramways Co.

The report of the directors for the year ended June 30th, 1912, contains the following comparative figures for the years 1911 and 1912:—

	1911.	1912.	
Total receipts	£35,644	£36,713	Inc. £1,069
Total expenditure ..	27,159	26,730	Dec. 429
Net profit	£8,485	£9,983	Inc. £1,498

The above amounts for expenditure include debenture interest, donations, and London expenses. To the sum of £9,983 is added £1,013 brought forward, making a total of £10,996 to be dealt with. The directors recommend that this amount should be appropriated as follows:—£2,500 to reserve fund account; £7,920 to the payment of 3 per cent. dividend on the shares for the year ended June 30th, 1912; £576 to be carried forward.

	1911.	1912.
Car-miles run	1,039,885	1,060,453
Passengers carried	8,490,019	8,817,963
Earnings per c.m.	8·23	8·39
Expenses per c.m.	5·65	5·50
Earnings per passenger ..	0·99	0·97

Mr. George M. Chamberlin, the representative of the City of Norwich, retired, and the directors proposed to reappoint him, subject to the approval of the Corporation of Norwich.

The sixteenth annual general meeting was held on October 31st, at 8, Crosby Square, E.C., Baron E. B. d'Erlanger presiding.

The Chairman, in proposing the adoption of the above report, said he was pleased to say that the accounts showed some improvement over those for the preceding year. There was an increase in the gross receipts of £1,069, and a decrease in the expenditure of

£429, giving a net increase of profit of £1,498. He was pleased to say that the company's relations with the Norwich Corporation continued to be of the most cordial character. The receipts for the portion of the year that had elapsed since the closing of the accounts had been considerably interfered with by the disastrous floods that occurred in Norwich in the summer. Notwithstanding that they lost a good deal of traffic during the flood period, progress had been made since, and the receipts for the year up to date only showed a falling off of £850; therefore, unless some unforeseen circumstances should occur, they hoped that the deficiency might be made up before the end of the financial year.

MR. E. A. HOPKINS seconded the motion, and the report was adopted.

New General Traction Co., Ltd.

BARON EMILE B. D'ERLANGER presided on Thursday last week over the 16th annual meeting, held at the offices, 8, Crosley Square, E.C.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW, page 629), said that the accounts represented the results of 16 months' working, but as the situation had been completely altered by the sale of the Coventry tramways to the Corporation under the arbitration award, it would be no use talking of the past. As to the future, after the reconstruction, the capital of the company was now £262,000, represented by 262,000 shares of £1 each, all of the same category and enjoying the same rights. They had already received the purchase price under the award, and as soon as the formalities were completed, what was left of it, after paying the debenture debt and other debts of the Coventry Co., would be paid over to the shareholders of that company—in other words, to the New General Traction Co. When they had got that money in hand, it was their intention to pay off the balance of the £80,000 4 per cent. prior lien bonds—£68,000—and the whole of the floating debt, and a substantial part of the 5 per cent. mortgage debentures. He thought the minimum amount of debentures they would be able to pay off would be £60,000, so that the total capital of the company afterwards would be £262,000, with a debt of some £140,000 in 5 per cent. mortgage bonds. When they were at liberty to do so, tenders would be invited for those bonds, and the lowest would be accepted. In looking to the future they had to count upon their Philadelphian enterprise, which yielded them a fixed sum per annum, viz., £14,000. They would also have the dividends on their holding in the Norwich Tramways, which this year had yielded them £5,700, and they were in hopes that the yield would not be less in the future. They might also count upon certain dividends from their holding in the Douglas tramways, which would bring them in about £700, so that approximately they would have a total revenue of £20,500. From that would have to be deducted the expenses of the company, which were estimated at about £2,000, and 5 per cent. on the mortgage debentures, if there were about £140,000 of them in circulation, would require £7,000, so that the total deduction from the profits would be about £9,000, leaving about £11,500 for distribution. A dividend of 4 per cent. would absorb £10,480, and leave a small balance to be carried over.

MR. E. A. HOPKINS seconded the motion.

The CHAIRMAN, in reply to a shareholder who asked for an explanation of an item of £1,448 appearing in the balance-sheet as the cost of shares in the Light Railways Syndicate, Ltd., said that the company had a small interest in some light railways in Essex, which they sold for a certain amount in cash, and they also received a certain number of shares. Personally, he did not think there was much prospect of the shares ever being of any value.

The report was then adopted.

German Electrical Companies.

THE accounts of the *Deutsche Elektrizitats Werke Garbe, Lahmeyer and Co., of Aix-la-Chapelle*, show that the sum of £11,000 has been allocated to the depreciation fund in 1911-12, as compared with £8,500 in the preceding year. Including the balance forward, the net profits amount to £40,000, as against £38,000 in 1910-11, and a dividend of 5 per cent. has been declared on the share capital of £150,000, being the same rate as in the previous 12 months. The special reserve fund receives £5,000 and the dividend equalisation fund £15,000, as in 1910-11, leaving a balance of £12,000 to be carried forward.

The *A G. für Stickstoffdunger, of Knapsack*, reports profits on manufacturing of £25,000 in the financial year comprising the six months ended with June, 1912, as compared with £21,000 in the 12 months ended with 1911. After placing £9,800 to depreciation and making other allocations, the net profits are returned at £11,900, which sum permits of the payment of a dividend for the six months at the rate of 6 per cent. per annum on the share capital of £150,000. In 1911 the share capital was reduced from £180,000 to £120,000, in order to extinguish the deficiency incurred in 1910 and to provide for depreciation, and it was then raised to £150,000 for the extension of the power plant, whilst the net profits of £87 in 1911 were carried forward. The directors' report states that the production of sulphate of ammonia in the first six months of the present year yielded suitable profits, but the prices for cyanamide were unsatisfactory, although the conditions for carbide slightly improved.

The results of the *Bayerische Stickstoff Werke, of Munich*, in the year 1911-12, which ended on May 31st, 1912, were unfavourably influenced by an explosion which occurred in the cyanamide works in June, and operations had to be suspended until the middle of November. During the succeeding four weeks, carbide alone was produced, the output of cyanamide only being able to be resumed in December. The low water level of the Alz caused through the drought in 1911 also rendered it impossible to work at full power, and, in the circumstances, the period of production in the financial year only comprised 4½ months. The sale of cyanamide in agricultural circles increased, and the extraction of sulphate of ammonia had been commenced. After providing for depreciation, losses by fire, and extinguishing the deficit brought forward, the accounts exhibit net profits of £123 on a share capital of £330,000, which sum has been placed to a reserve fund.

The report for 1911-12 of the *Berliner Electrizitäts Werke*, which control the supply of light and power in Berlin, states that the number of consumers increased by 3,744 to 36,909, and the value of the connections advanced by 9·8 per cent. to 226,940 KW., of which 86,252 KW. devolved upon lighting, 119,279 KW. on power supply, and 21,409 KW. on high-pressure current for industrial purposes. Including the consumption of the company's own works, the output amounted to 223,370,000 KW.-hours, as contrasted with 198,030,000 KW.-hours in the previous year. Lighting absorbed 54,260,000 KW.-hours, power supply 75,650,000, railways 69,850,000, and high-pressure supply 23,610,000 KW.-hours, as against 9,820,000 KW.-hours in 1910-11. The maximum demand at any one time reached 94,570 KW., as compared with 87,685 KW. in the preceding year. As a consequence of the augmentation in the output for railway working and of high-pressure current, which at the same time caused a reduction in the cost of production, the average price realised in Berlin, after deducting local taxes, declined from 15·36 pfennigs per KW.-hour in 1910-11, to 14·75 pfennigs last year. If the gross profits did not increase in the same degree as the number of connections and the supply of energy, the report states that this is due, apart from the advance in the cost of materials, to the progressive participation of the industries of Berlin and suburbs in the purchase of current. The accounts show the following figures for the past two years:—

	1911-12.	1910-11.
Ordinary share capital	£2,205,000	£2,205,000
Preference (4½ per cent.) shares	1,000,000	1,000,000
Loan debt	2,847,500	2,878,500
Gross profits	910,000	877,000
Renewals fund	28,500	26,900
Depreciation	238,000	222,000
Municipal share in profits	187,000	174,000
Net profits	547,000	529,000
Dividend on ordinary shares	264,000	264,000
" " " per cent.	12	12

The report mentions that the turbine of 20,000 KW. for the Oberspree station is nearly ready, and a second for the Rummelsburg station is in course of construction. Including balances at banks the accounts indicate debtors for £242,000 as compared with £244,000 in the previous year, whilst creditors have increased from £335,000 in 1910-11 to £756,000 in the past year. On the other hand, securities and other investments represent £1,512,000, as compared with £1,278,000 in 1910-11.

Buenos Ayres City and Suburban Tramways Co., Ltd.—Mr. George Kitching, the chairman, presided on Wednesday over an extraordinary general meeting of the shareholders of this company, held at 2, Broad Street Place, E.C., when the following resolution, which was passed at the ordinary meeting held on October 18th, was confirmed as a special resolution: "That Article 4 of the company's articles of association be altered by deleting therein the figure '77,001' and substituting therefor the figure '1,' and also by deleting therein the figure '192,000' and substituting therefor the figure '115,000.'"

STOCKS AND SHARES.

Tuesday Evening.

MARKETS are swayed so much from day to day by the number of cross-currents, that it is impossible to say there is any definite tendency. On Tuesday it is Austria which provides the nigger in the hedge; on Friday morning the whole set of conditions may have been kaleidoscoped, and the considerations of the earlier part of the week lost in oblivion. Members of the Stock Exchange just grope their way in the twilight, with little to guide them in answering the innumerable inquiries from clients as to what ought to be done in markets such as these.

The only advice which experience knows to be correct is that good stocks should be held until more settled times. Even this, however, does not necessarily apply to such securities as Consols, which are overburdened by an ever-increasing volume of new competing issues. In the electrical markets, however, quotations, as a rule, are well held, and excitement is confined to an extremely limited circle.

One of these circles is that for Underground Railway stocks; the temptation to descend to an extremely obvious pun must be manfully resisted. Metropolitans have fluctuated violently. From 52½ the price jumped to 55½, and after receding a little, it finishes with a rise of 2¼ on the week. Districts are quieter, and of late the

speculation in them has died down considerably, but Underground Electric Railways spurted, the Ordinary shares rising to 4, while the 1s. shares advanced to 13s. The reason for the Metropolitan's acquisition of the Great Northern and City Company remains a cause of much perplexity and curiosity. Nothing has transpired to account for this deal at present. Rumours of the Midland taking decisive action brought about a jump of 2 points in City and South London Ordinary, but the improvement did not last. Great Northern and City Preferred remain at 2⅛. East Londons eased off to 8⅜ before rallying to 9⅛. Central London Ordinary and Deferred are both a little better.

No improvement has occurred in British Electric Traction issues—in fact, the 7 per cent. Preference stock is down another point. London United Tramways Debenture after being better, eased off again; the Preference kept steady at 5⅜ middle, and expectation is keen as to the announcement which is looked for with reference to some kind of working agreement between this Company, the Metropolitan Electric Tramways, and the London County Council.

Liquidation in other parts of the House brought a few sellers into the English Electricity Supply market, with the result that three or four falls have occurred. The principal is a drop of 10s. in City of London Preference; the Ordinary retain their comparative steadiness at 17. Counties, however, are ¼ easier at 11½. Chelseas again shed ⅛, and Metropolitans are an equal fraction lower at 3¾. In consequence of this, the yield on the last-named company's Ordinary shares is now the level 5 per cent. The dulness of the market during the past two or three weeks affords some evidence that the recent attempt to make capital out of a possible amalgamation or working agreement between the various companies, local authorities and others was at least ill-timed; for, as we ventured to observe last month, the information is at all events premature. Those who bought shares on the anticipation of early and substantial advances in prices must be somewhat disappointed.

The Colonial and Foreign group of supply and power undertakings has not attracted much attention. Good stock is scarce, as may be exemplified by reference to an order given the other day to a broker for the purchase of River Plate Debenture stock, an order which the broker had to return because he was unable to find any on offer. River Plate Preference, by the way, is *ex* dividend, and the price is 3 points lower in consequence. Northern Light and Power bonds are also quoted *ex* dividend, the distribution taking the shape of deferred interest warrants, as before. The Mexican issues are quietly steady, with two or three rises to their credit. Monterey Fives recovered ½. Mexican Light and Power Common gained 1, and the three bond issues of the Mexican Light and Mexico Tramways Companies are all harder. On the other hand, Mexico Tramways Common shares fell 2, the market being influenced by depression in Brazilian Traction shares, which have given way by reason of selling from Paris and Brussels. British Columbia descriptions moved up on Monday last, the 5 per cent. Preference stock putting on 1½, and the Deferred stock rising 2. Rio Trams, Montreals, and Shawinigans are comparatively steady, though the last-named seems to come on offer as soon as buyers make their appearance. A good rise has been secured by Toronto Power 4½ per cent. Debenture stock, which at 100½ is 3 up, and the honour is shared by Canadian General Electric Common with a similar gain at 120.

National Telephone Deferred is still on the sliding scale, the price falling back to 153, which is some 10 points below the highest touched recently. Probably some of the stock which has come to market during the last fortnight is for account of weak holders forced to realise, because people who profess to have an intimate acquaintance with what is going on, maintain that the stock is well undervalued at 160. Still, it is not the thing which the cautious buyer would touch unless he knew something of what was taking place behind the scenes. Marconi's, after being 5¼ bid, eased off to 5⅛. The evidence which is being taken before the Select Committee of the House of Commons is declared in the market to be favourable to the price of the shares, but the reasoning which leads to this conclusion may be more clear to our readers than it is to us. The market position in Marconi's, as in other speculative shares, is a good deal clearer than was the case a week or two back; and part, at any rate, of the improvement in the price of the shares is simply the result of bear purchases.

Success attended the issue of the £60,000 6 per cent. Debentures offered by the Indian Electric Supply and Traction Company, and the price in the market is 1 to 2 premium. Manufacturing shares as a whole are steady. Brush Second Debenture has been marked down 3½ points. Edison & Swan hardened to 8s. 9d., but reverted to 7s. 6d. middle. Rubber shares remain dull on the sagging of the price of the raw stuff, and at this week's sales in Mincing Lane about a penny per pound less was obtained than was the case a fortnight ago.

Grassington Electric Supply Co.—At the annual meeting held at Grassington last week, Mr. C. E. Lowcock, chairman, presiding, the accounts for the year ended August 31st, showed that the revenue from light supplied was £154. It was reported that a considerable extension of plant had been made during the year, and arrangements had been made with the Linton Mills Estates Co. on favourable terms for the acquisition of additional power, not only for present needs, but for extensions.

Edmundson's Electricity Corporation, Ltd.—The petition for the confirmation of the reduction of the capital from £800,000 to £640,000, is to be heard by Mr. Justice Neville on Tuesday next, November 12th.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and may vary according to quantities and other circumstances.

Wednesday, November 6th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a „ Nitric	„	22/-	..
a „ Oxalic	per lb.	2¾d.	..
a „ Sulphuric	per cwt.	5/6	..
a Ammoniac Sal	„	42/-	..
a Ammonia, Muriate (large crystal)	per ton	£29 10	..
a Bleaching powder	„	£5 10	..
a Bisulphide of Carbon	„	£18	..
a Borax	„	£16 10	..
a Copper Sulphate	„	£26	..
a Lead, Nitrate	„	£29 10	£3 inc.
a „ White Sugar	„	£25 10	..
a „ Peroxide	„	£32	..
e Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (88/90 %) ..	per ton	£22 10	..
a „ Chlorate	per lb.	3½d.	..
a „ Perchlorate	„	4½d.	..
a Potassium, Cyanide (98/100 %) .. (for mining purposes only)	„	7½d.	..
a Shellac	per cwt.	70/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers ..	„	£6 10	..
a „ Recovered	„	£5 10	..
a „ Lump	„	£5 5	..
a Soda, Caustic (white 70/72 %) ..	„	£10 5	..
a „ Chlorate	per lb.	3⅜d.	..
a „ Crystals	per ton	£3 5	..
a Sodium Bichromate, casks ..	per lb.	3d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots ..	per ton	£85	..
b „ Wire, in ton lots ..	„	£112	..
b „ Sheet, in ton lots ..	„	£120	..
p Babbitt's metal ingots	„	£38 to £145	..
c Brass (rolled metal 2" to 12" basis)	per lb.	9¼d.	..
c „ Tube (brazed)	„	11¼d.	..
c „ „ (solid drawn) ..	„	9½d.	..
c „ Wire, basis	„	9¼d.	..
c Copper Tubes (brazed)	„	1/0⅝d.	..
c „ „ (solid drawn) ..	„	11¼d.	..
g „ Bars (best selected) ..	per ton	£92	£1 inc.
g „ Sheet	„	£92	£1 inc.
g „ Rod	„	£92	£1 inc.
d „ (Electrolytic) Bars ..	„	£82	..
d „ „ Sheets ..	„	£99	..
d „ „ Rods ..	„	£87	..
d „ „ H.C. Wire	per lb.	10⅝d.	..
f Ebonite Rod	„	5/8	..
f „ Sheet	„	4/9	..
n German Silver Wire	„	1/10	..
h Gutta-percha, fine	„	..	..
h India-rubber, Para fine	„	4/3½	2¾d. dec.
l Iron Pig (Cleveland warrants) ..	per ton	66/9	7d. inc.
l „ Wire, galv. No. 8, P.O. qual.	„	£14	..
g Lead, English Pig	„	£18 15	17/6 dec.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£7 12 6	7/6 dec.
e Mica (in original cases) small ..	per lb.	6d. to 3s.	..
e „ „ „ medium	„	3/6 to 6/-	..
e „ „ „ large ..	„	7/6 to 11/-	..
p Phosphor Bronze, plain castings	„	11d.	..
p „ „ rolled bars & rods	„	1/0½	..
p „ „ rolled strip & sheet	„	1/1	..
o Platinum	per oz.	185/-	..
d Silicium Bronze Wire	per lb.	11½d.	..
Steel, Magnet, in bars	per ton	£55	..
g Tin, Block (English)	„	£231	dec.
n „ Wire, Nos. 1 to 16	per lb.	2/8	1d. inc.
p White Anti-friction Metals ..	per ton	£45 to £150	..
k Zinc, Sh't (Vieille Montagne bnd.)	„	£31 12 6	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
l Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

Prospectuses. — *The Indian Electric Supply and Traction Co., Ltd.*—The list closed on Wednesday in an offer of £60,000 6 per cent. debentures at 94 per cent. The proceeds will be applied first in paying off an existing issue of £48,296 of 6 per cent. debenture stock, thus freeing the company's assets from all existing charges.

Mexico Tramways Co.—It is announced that for the purposes of providing funds for extensions to the tramway system, for advances to subsidiary companies in connection with the developments of their plants and business, and for repaying temporary loans, and for other purposes, the board have decided to offer for subscription at par, the balance remaining unissued of the share capital of the company, viz., 35,000 shares of $100 each.

West African Telegraph Co., Ltd.—The directors have declared an interim dividend at the rate of 4 per cent. per annum for the six months ended at June 30th.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Nov. 5th.	Rise + or Fall −	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord.	10	5½	5†	9⅛ — 10⅛	..	5 4 9
Do. 4½ % Pref.	10	4½	4½	8⅞ — 9⅜	..	4 12 4
Do. Second 6 % Pref.	10	6	6	10 — 10⅜	..	5 14 8
Do. 4½ % Deb. Stock	Stock	4½	4½	98 —100	..	4 10 0
Brompton & Kensington, Ord.	5	10	9†	9 — 9⅛	..	5 5 3
Do. 7 % Cum. Pref.	5	7	7	8¾ — 9	..	3 17 9
Central Electric Supply, 4 % Guar. Deb.	100	4	4	97 —100	..	4 0 0
Charing Cross, West End & City	5	5	5†	4⅞ — 5⅛	..	4 13 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅜ — 4⅝	..	4 14 9
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	4 — 4½	..	5 0 0
Do. Do. 4 % Deb.	100	4	4	94 — 96	..	4 3 4
Chelsea, Ord.	5	5	4†	4¼ — 4¾	— ⅛	5 5 3
Do. 4½ % Deb.	Stock	4½	4½	98 —101	..	4 9 1
City of London, Ord.	10	8	6†	16 — 18	..	4 9 0
Do. 6 % Cum. Pref.	10	6	6	12 — 13½	— ½	4 9 0
Do. 5 % Deb.	Stock	5	5	118 —122	..	4 2 0
Do. 4½ % Second Deb.	100	4½	4½	99 —102	..	4 8 8
County of London, Ord.	10	6	4†	11 — 11½	— ¼	5 4 4
Do. 6 % Pref.	10	6	6	11⅝ — 12⅝	..	4 19 0
Do. 4½ % Deb.	Stock	4½	4½	106 —108	..	4 3 4
Do. 4½ % Second Deb.	Stock	4½	4½	98 —101 xd	..	4 8 8
Edmundson's, Ord.	5	Nil	..	7/16 — 11/16	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	3— 3½	..	Nil
Do. 4½ % First Mort. Deb.	100	4½	4½	84 — 87	..	5 3 6
Folkestone	5	6	6	4⅝ — 5⅛	..	5 17 1
Do. 5 % Cum. Pref.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % First Deb.	100	4½	4½	92 — 95	..	4 14 9
Hove	5	9	8†	7⅞ — 7⅝	..	5 14 3

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Nov. 5th.	Rise + or Fall −	Present Yield p.c. £ s. d.
Kensington & Knightsbridge, Ord	5	9	8†	7⅛ — 8	..	5 12 6
Do. 4 % Deb.	Stock	4	4	90 — 93	..	4 6 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	78 — 82	..	5 9 9
London Electric, Ord.	8	2½	..	1⅝ — 2⅛	..	3 10 8
Do. 6 % Pref.	5	6	6	4⅝ — 5¼	..	5 14 8
Do. 4 % First Mort. Deb.	Stock	4	4	90 — 93	..	4 6 0
Metropolitan	5	4	4†	3½ — 4	— ⅛	5 0 0
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4⅜	..	4 17 4
Do. 4½ % First Mort. Deb.	Stock	4½	4½	99 —102	..	4 8 3
Do. 3½ % Mort. Deb.	Stock	3½	3½	86 — 88	..	3 19 7
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	97½ — 99½	..	4 10 6
Newcastle-on-Tyne 5 % Pref., Non-Cum.	5	5	5	4⅜ — 4⅞	..	5 2 7
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98½ —101½	..	4 18
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	10 — 11	..	5 9 1
Oxford	5	7½	6†	6 — 6½	..	5 11 6
St. James' and Pall Mall, Ord.	5	10	10†	9½ — 10½	..	4 17 7
Do. 7 % Pref.	5	7	7	6½ — 7½	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	85 — 88	..	3 19 7
Smithfield Markets, Ord.	5	2	..	1⅝ — 1⅞	..	..
South London, Ord.	4	5	..	3 — 3½	..	5 14 3
Do. 5 % First Mort. Deb.	100	5	5	98 —101	..	4 19 0
South Metropolitan, 7 % Pref.	1	7	7	1¼ — 1⅜	..	5 12 0
Do. 4½ % First Deb. Stock	100	4½	4½	96 — 99	..	4 11 0
Urban, Ord.	£3	Nil	..	¼ — ⅜	..	..
Do. 5 % Cum. Pref.	5	2	‡	2⅛ — 3½	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	84½ — 88½	..	5 1 8
Westminster, Ord.	5	10	9†	8½ — 9½	..	5 8 1
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 5⅛	..	4 5 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5¼ — 5⅝	..	5 4 4
Calcutta, Ord.	5	8½	..	7 — 7⅛	..	5 13 4
Do. 5 % Pref.	5	5	5	4⅛ — 5⅛	..	4 16 5
Calgary Power, 1st Mort. Bds.	100	5	5	92½ — 94½	..	5 5 9
Canadian Gen. El. Com.	$100	7	7	118 —122	+3	5 14 9
Do. 7 % Pref.	$100	7	7	118 —122	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	8	..	⅞ — 1	..	3 0 0
Do. 5 % Deb.	100	5	5	£4 — 97	..	5 3 1
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	£3 — 95	+1	6 6 4
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	83 — 86	..	5 16 3
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	95½ — 97½	..	5 2 7
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	1/16 — 5/16	..	Nil
Do. 6 % Pref.	1	6	6	13/16 — 1 1/16	..	6 14 6
Kaministiquia Power, 5 % G. Bs.	$500	5	5	104 —106	..	4 14 4
Madras, Ord.	5	Nil	..	1⅛ — 2	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	102 —105	..	4 15 3
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	86 — 88	..	5 18 8
Mexican Lt. & Power, Common	$100	4	4†	84 — 87	+1	4 12 0
Do. 7 % Cum. Pref.	$100	7	7	102 —105 xd	..	6 13 4
Do. 5 % 1st Mort. Gold Bds.	..	5	5	95 — 97	+1½	5 3 1

Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	83¼ — 86¼	+ ½	5 15 7
Montreal, Lt., H. and Power	$100	8	9†	231 —236 xd	..	3 16 3
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	5a	39 — 42 xd	..	..
River Plate, Ord.	Stock	10	..	240 —250	..	4 0 0
Do. 6 % Non-Cum. Pref.	Do.	6	6	106 —111 xd	..	5 5 3
Do. 5 % Deb. Stock	Do.	5	5	102 —104	..	4 16 2
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	98 —100	..	4 10 0
Shawinigan Water, Capital	$100	5	5	140 —144	—1	3 11 5
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	106 —108	..	4 12 9
Do. 4½ % Per. Deb.	Stock	4½	4½	102½ —104½	..	4 6 2
Toronto Power, 4½ % Deb.	Do.	4½	4½	99½ —101½	+3	4 7 5
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	93 — 96	..	5 4 2
Victoria Falls Power, Pref.	1	11 7/16d.	17/16d.	15/16 — 1	..	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103 —105	..	5 14 3

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	4	..	7⅞ — 8½	..	4 18 6
Do. 5 % Deb. Red.	Stock	5	5	96 — 98	..	5 2 0
American Telep. & Teleg., Cap.	$100	8	8†	145½ —147½	..	5 8 6
Do. Collat. Trust	$1000	4	4	93¾ — 95¾	..	4 8 9
Anglo-American Telegraph	Stock	8	8	67 — 69	..	4 7 0
Do. 6 % Pref.	Do.	6	6	110½ —111½	..	5 7 7
Do; Def.	Do.	80/-	..	25⅝ — 25⅞	— ¼	5 17 1
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	5	7	8	7⅝ — 7¾	..	4 8 11
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	81 — 83	..	4 16 3
Cuba Telegraph	10	6	..	9½ — 10⅛	..	5 14 3
Do. 10 % Pref.	10	10	10	16½ — 17⅝	..	5 14 3
Direct Spanish Telegraph, Ord.	5	4	4†	3¾ — 4	..	5 0 0
Do. 10 % Cum. Pref.	5	10	10	6⅜ — 7¼	..	6 18 0
Direct United States Cable	10	5	4	7⅛ — 7⅜ xd	..	6 11 2
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7†	129 —132	..	5 6 1
Do. 8½ % Pref. Stock	Do.	8½	8½	77 — 79	..	4 8 1
Do. 4 % Mort. Deb.	Do.	4	4	98 —100	..	4 0 0
Eastern Extension	10	7	7†	12⅝ — 13⅜	— ⅛	5 6 8
Do. 4 % Deb.	Stock	4	4	99 —101 xd	..	3 19 3
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	98 —101 xd	+2	3 19 3
Globe Telegraph and Trust	10	6	6†	10⅜ — 11½	..	5 7 7
Do. 6 % Pref.	10	6	6	12⅜ — 13½	..	4 10 7
Great Northern Telegraph	10	18	18	28 — 29	..	6 4 2
Indo-European Telegraph	25	13	6†	56¾ — 58½ xd	— ⅜	5 11 1
Mackay Companies Common	$100	5	5†	86 — 89	..	5 12 4
Do. 4 % Cum. Pref.	$100	4	4	69 — 73	..	5 9 7
Marconi's Wireless Telegraph	1	20	..	5 1/16 — 5 3/16	+ 1/16	3 17 0
Do. 7 % Cum. Partic. Pref.	1	17	..	4⅜ — 4⅝	..	3 14 0

Monte Video Telephone, Ord.	1	6	5†	1/16 — 1 1/16 xd	..	5 13 0
Do. 5 % Pref.	1	5	5	3/16 — 5/16 xd	..	5 14 8
National Telephone Def.	Stock	6	..	152½ —154½	—1½	..
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	97⅜ — 98⅜ xd	..	4 11 2
Oriental Telep. and Elec.	1	8	6†	1 31/32 — 1 33/32 xd	..	4 9 9
Do. 6 % Cum. Pref.	1	6	6	1 1/16 — 1 3/16 xd	..	5 0 10
Do. 4 % Red. Deb.	Stock	4	4	88 — 90	..	4 9 0
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	98 —100	..	4 0 0
Reuter's	10	10	10†	10⅞ — 11⅜	..	8 16 2
Submarine Cables Trust	Cert.	6	6	126 —129	..	4 18 0
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99½ —101½	..	4 8 8
United River Plate Telephone	5	8	..	7½ — 7¾	— 3/16	5 6 8
Do. 5 % Cum. Pref.	5	5	5	5⅝ — 5⅞	..	4 8 11
West Coast of America	2½	2½	..	1 13/32 — 1 15/32	..	8 18 5
Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	100	4	4	96 — 99	..	4 0 10
West India and Panama Teleg.	10	2½	..	3¼ — 3⅜	— ⅛	..
Do. 6 % Cum. 1st Pref.	10	6	6	10⅜ — 11½	..	5 7 10
Do. 6 % Cum. 2nd Pref.	10	6	6	9⅜ — 10½	..	5 17 0
Do. 5 % Debs.	100	5	5	101 —103	..	4 17 1
Western Telegraph, Ltd.	10	7	7†	13¼ — 13¾	..	5 1 10
Do. 4 % Deb.	Stock	4	4	96⅜ — 98⅜	..	4 1 8
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	98 — 101	— ½	4 9 1

Unless otherwise stated, all shares are fully paid. a Paid in deferred interest warrants. † Interim Dividend. ‡ 3s. in Funded Dividend Certs

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Nov. 5th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bath Trams, Pref. Ord.	* 1	Nil	Nil		..	Nil
Do. 5 % Pref.	1	5	5		..	
Do. 4½ % Deb.	100	4½	4½	76 — 81	..	5 11 1
Brit. Elec. Trac., 6 % Pref.	100	..	..		..	..
Do. Do. Deferred	100	..	..	5 — 7	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	89 — 92	..	6 10 5
Do. 7 % Non-Cum. Pr'f.	100	..	..	86 — 89	—1	..
Do. 5 % Perp. Deb.	100	5	5	90 — 94	..	5 11 1
Do. 4½ % 2nd Deb.	100	4½	4½	77 — 81 xd	..	5 7 2
Central London Railway, Ord.	100	3	3†	73 — 75	+1	4 0 0
Do. Pref.	100	4	4	83 — 85	..	4 14 2
Do. Def.	100	2	..	72 — 74	+1	2 14 1
Do. 4 % Deb.	100	4	4	100 —102	..	3 18 5
City & South London, Ord.	100	1⅞	1½†	42 — 43	..	3 4 0
Do. 5 % Pref., 1891	100	5	5	107 —109	..	4 11 9
Do. Do. 1896	100	5	5	106 —108	+1	4 12 7
Do. Do. 1901	100	5	5	106 —108	+1	4 12 7
Do. Do. 1903	100	5	5	106 —108	+2	4 12 7
Do. 4 % Deb.	100	4	4	97 —99 xd	..	4 0 10
Dublin United Trams, 6 % Pref.	10	6	6	12 — 13	..	4 12 4
Great Northern & City, Pr'f. Ord	10	Nil	Nil	2⅛ — 2⅜	..	Nil
Hastings Trams, 6 % Pref.	1	6	6†	7/16 — 9/16	..	8 6 8
Do. 4½ % Deb.	100	4½	4½	69 — 74	..	6 1 7
Isle of Thanet Trams, 5 % Pref.	5	2½	..	2⅛ — 2⅜	..	4 11 0
Do. 4 % Deb.	100	4	4	77 — 82	..	4 17 7
Lancashire United, 5 % Deb.	100	5	5	81 — 83	..	6 0 6
London Elec. Railw'ys, 4 % Deb.	100	4	4	95 — 97	..	4 2 6
London United Trams, 5 % Pref.	10	Nil	..	5⅛ — 5⅝	..	..
Do. 4 % Deb.	100	4	4	70 — 74	—2	5 8 1

NAME.	Stock or Share.	Dividends for 1911.	Dividends for 1912.	Closing Quotations Nov. 5th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Metropolitan Railway Consol.	* 100	1⅞	1½†	55 — 55½	+2½	2 19 1
Do. Surplus Lands	100	2¼	2¼†	63 — 65	..	4 4 7
Do. 8½ % Deb.	100	8½	8½	87 — 89	..	3 16 11
Do. 8½ % Pref.	100	8½	8½	84 — 86	..	4 1 5
Do. 8½ % Con. Pref.	100	8½	8½	84 — 86	..	4 1 5
Metropolitan District Ord.	100	Nil	Nil	39 — 39½	+ ⅜	Nil
Do. 6 % Deb.	100	6	6	141 —143	..	4 4 0
Do. 4 % Deb.	100	4	4	94 — 96	..	4 3 4
Do. 4 % Prior Lien	100	4	4	97 —99 xd	..	4 0 10
Do. 4½ % First Pref.	100	4½	4½	87 — 90	+1	5 0 0
Do. 8½ % Gtd.	100	8½	8½	75 — 77	..	4 11 0
Metropolitan Elec. Trams, Ord.	1	6	5†	1⅛ — 1¼	..	4 16 0
Do. Def.	1	Nil	..	3/32 — 5/32	..	Nil
Do. 5 % Pref.	1	5	5	3/32 — 5/32	..	5 10 6
Do. 4½ % Deb.	100	4½	4½	95 — 97	..	4 12 9
Do. 5 % Deb.	100	5	5	96 — 99	..	5 1 0
Potteries, Ord.	1	3½	..	1/16 — 3/32	—1/16	..
Do. 5 % Pref.	1	5	5	3/16 — 5/32	..	6 19 0
Do. 4½ % Deb.	100	4½	4½	87 — 90	..	5 0 0
South Metro. Trams, 6 % Pref.	1	6	..	1/16 — 1/8	..	7 7 8
Do. 4 % Deb.	100	4	4	67 — 72	—3	5 11 1
Underground Elec. Railways	10	..	..	3/32 — 4½	+ 1/8	Nil
Do. "A"	1/-	..	..	1/16 — 3/32	..	..
Do. 4½ % Bonds	100	4½	4½	99 —101	..	4 9 1
Do. 6 % Income	100	1½	£2	87 — 89	+1	..
Yorkshire (West Riding), Ord.	5	Nil	..	1/16 — 3/32	..	Nil
Do. 6 % Pref.	5	3	..	2⅛ — 3/32	..	4 9 0
Do. 4½ % Deb.	100	4½	4½	79 — 83	..	5 8 5

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4⅞ — 5⅛	..	5 7 4
Do. 2nd Pref.	5	5½	5½	4⅛ — 4⅜	— ⅛	5 17 4
Do. 4 % Deb.	100	4	4	91½ — 93½	..	4 5 7
Do. 4½ % Deb.	100	4½	4½	99 —101	..	4 9 1
Do. 5 % Deb.	100	5	5	99 —101	..	4 19 0
Auckland Trams, 5 % Deb.	100	5	5	103½ —105½	..	4 14 9
Bombay Elec. S. & Trams, Pref.	10	6	6	11¼ — 12	..	5 0 0
Do. 4½ % Deb.	100	4½	4½	98 —100	..	4 10 0
Do. 5 % 2nd Deb.	100	5	5	98 —100	..	5 0 0
Brisbane Trams Invt., Ord.	5	8	8†	7⅛ — 7⅜ xd	..	5 9 5
Do. 5 % Pref.	5	5	5	4⅞ — 5⅛ xd	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	100½ —103½	..	4 7 0
B. Columbia Elec. Rly., Def.	100	8	..	144 —149	+2	5 7 5
Do. Pref. Ord.	100	6	6	116 —120	+ ½	5 0 0
Do. 5 % Pref.	100	5	5	106 —109	+1½	4 11 9
Do. 4½ % 1st Mort. Deb.	40	4½	4½	98 —101	..	4 9 1
Do. 4½ % Vancouver Deb.	100	4½	4½	103 —105	..	4 5 9
Do. 4½ % Con. Deb.	100	4½	4½	101 —103	..	4 2 6
Calcutta Trams, Ord.	5	7	5†	6 — 6½	..	5 7 8
Do. 5 % Pref.	5	5	5	4⅛ — 5⅜	..	4 16 5
Do. 4½ % Deb.	100	4½	4½	99 —102	..	4 8 8
Cape Electric Trams	1	2½	..	1/16 — 1/8	..	..
City Buenos Aires Trams (1904)	5	5	5†	5⅛ — 5⅜	..	4 6 11
Do. 4 % Deb.	100	5	5	99 —102	..	4 18 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	93 — 97 xd	..	5 2 1
Havana Elec. Rly., 5 % Bonds	$1000	5	5	99 —103	..	4 17 1
Kalgoorlie Elec. Trams	1	Nil	..	3/16 — 5/16	..	Nil
Do. 5 % A Deb.	100	5	5	86 — 91	..	5 10 0
Do. 6 % B Deb.	100	6	3	35 — 43	..	..
La Plata Elec. Trms, Ord.	1	Nil	..	1/16 — 3/32	..	..
Do. Pref.	1	6	..	3/32 — 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	6	6†	1 — 1⅛ xd	..	4 16 0
Do. 6 % Pref.	1	6	6	1 — 1⅛	..	4 16 0
Do. 5 % Deb.	100	5	5	93 — 97	..	5 3 1
Madras Elec. Tr. (1904), Deb.	100	5	5	100 —102	..	4 18 0
Manaos Trams & Lt., 1st Deb.	100	5	5	91 — 94	..	5 6 5
Manila Elec. R. and Ltg., Bonds	$1000	5	5	100½ —102½	..	4 17 7
Mexico Trams Com.	$100	7	7†	111 —115	+2	6 1 9
Do. Gen. Con. 5 % Bonds	..	5	5	95 — 97	+2½	5 3 1
Do. 6 % Bonds	100	6	6	97 —100	+ ½	6 0 0
Para Elec. Rlys. & Lt., Ord.	5	10	10†	7⅛ — 7⅜	..	6 12 5
Do. 6 % Pref.	5	6	6	5 — 5⅛	..	5 9 1
Do. 5 % 1st Deb.	100	5	5	99 —101	..	4 19 0
Perth (W.A.) Elec. Tr., Ord.	1	5	5†	1⅛ — 1⅜	..	1 16 4
Do. 5 % 1st. Deb.	100	5	5	99 —102	..	4 18 0
Rangoon El. Tr. & Sup., Pref.	5	6	6	5⅜ — 6	+ ⅛	5 0 0
Do. 4½ % 1st Deb.	100	4½	4½	99 —101	—2	4 9 1
Rio de Janeiro Trams	$100	5	5†	145 —155	..	3 4 6
Do. 1st Mort. 5 % Bonds	..	5	5	100½ —102½	..	4 17 7
Do. 5 % Mort. Bonds	100	5	5	96 — 98	+ ⅛	5 2 0
Sao Paulo Tram, Lt. and P.	$100	10	10†	255 —265	..	3 15 6
Do. 5 % 1st Deb.	$500	5	5	102 —104	..	4 14 4
Singapore Trams, 5 % Deb.	100	5	5	82 — 85	..	5 17 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	96 — 98	..	5 2 0
Un. Elec. Trams Monte Video	5	7	..	5⅝ — 6⅛	..	5 14 3
Do. 6 % Pref.	5	6	..	5 — 5⅛	..	5 9 1
Do. 5 % 1st Deb.	100	5	5	99 —102 xd	..	4 18 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	101 —103	..	4 7 5

MANUFACTURING COMPANIES.

Aron, Ord.	1	6	..	1/32 — 3/32	..	8 0 0
Do. 6 % Pref.	1	6	6	11/16 — 13/16	..	7 7 8
Babcock & Wilcox	1	28	14†	3 — 3½	..	4 6 2
Do. Pref.	1	6	6	1 7/16 — 1 9/16	..	3 16 10
British Aluminium, Ord.	1	Nil	..	1/16 — 1/8	..	..
Do. 6 % Cum. Pref.	1	Nil	..	1/32 — 3/32	..	..
Do. 5 % Prior Lien Debs.	100	5	5	92 — 95	..	5 5 2
Do. Deb. Stk.	100	5	5	86 — 89	..	5 12 4
B.I. & Helsby Cables	5	10	8†	7⅜ — 8	..	6 5 0
Do. Pref.	5	6	6	5⅝ — 6⅜	..	4 14 1
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	94 — 96	..	4 13 9
British Westinghouse, Pref.	3	Nil	Nil	1/32 — 3/32	..	Nil
Do. Deb.	100	4	4	60 — 63	..	6 7 0
Do. 6 % Prior Lien	100	6	6	100 —103	..	5 16 6
Browett, Lindley, Ord.	1	..	..	2/- —3/-	..	Nil
Do. Pref.	1	..	..	4/6 —5/-	..	Nil
Bruah, 7 % Pref.	2	Nil	Nil	0 — 1/32	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	75 — 80	..	6 5 0
Do. 4½ % Deb.	100	4½	4½	47 — 52	..	8 13 2
Do. 4½ % Second Deb.	100	4½	4½	32 — 36	—3½	12 10 0
Callender's Cable	5	15	10†	10⅜ — 11 xd	..	6 16 4
Do. Pref.	5	5	5	4⅞ — 5⅛	..	4 17 7
Do. Deb.	100	4½	4½	99½ —101½	..	4 8 8
Castner-Kellner	1	20	15†	3⅜ — 3½	..	5 3 1
Do. Deb.	100	4½	4½	105 —108	..	4 3 4
Crompton & Co.	3	Nil	..	1/16 — 3/32	..	Nil
Do. Deb.	100	5	5	56 — 66	..	7 11 6
Dick, Kerr	1	5	Nil	1/32 — 1/16	..	..
Do. Pref.	1	6	6	1/32 — 1/16	..	6 8 0
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Edison & Swan, A, £3 paid	5	Nil	..	1/16 — 1/8	..	Nil
Do. fully paid	5	Nil	..	1 7/16 — 2	..	Nil
Do. 4 % Deb.	100	4	4	65 — 69	..	5 16 0
Do. 5 % Second Deb.	100	5	5	72 — 75	..	6 13 4
Electric Construction	2	2½	3⅜	3/4 — 1	..	7 10 0
Do. Pref.	2	7	7	1 3/16 — 2	..	7 0 0
Greenwood & Batley, Pref.	10	7	7	7⅞ — 8	..	8 5 8
Do. Deb.	100	5	5	92 — 94	..	5 4 2
General Electric, Pref.	10	5	5	10 — 11	..	..
Do. Deb.	100	4	4	90 — 95	..	4 4 3
Henley's, Ord.	5	17	5†	12 — 12⅜	..	6 13 4
Do. Pref.	5	4½	4½	4 1/16 — 6⅛	..	4 9 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
India-Rubber, G. & T.	10	..	..	10⅜ — 11½	..	..
Do. Pref.	10	5	5	9⅜ — 10⅝	..	4 17 7
Telegraph Construction	12	17½	5†	34 — 36	..	6 13 4
Do. Deb.	100	4	4	98 —100	..	4 0 0
Willans & Robinson	1	Nil	..	1/32 — 1/16	..	Nil
Do. Pref.	5	Nil	..	1/32 — 1/16	..	Nil
Do. Deb.	100	4	4	58 — 60	..	6 13

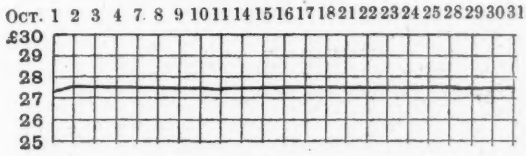
* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Bank rate of Discount 5 per cent., October 17th, 1912.

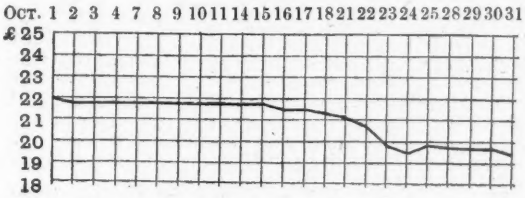
METAL MARKET.

Fluctuations in October.

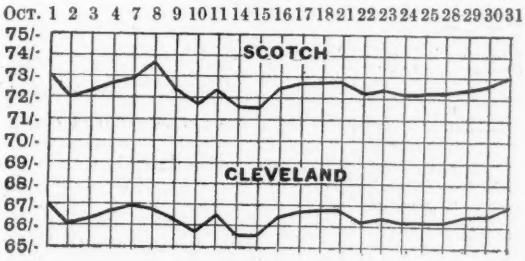
SPELTER (G.O.B's.).



LEAD (ENGLISH).



IRON.



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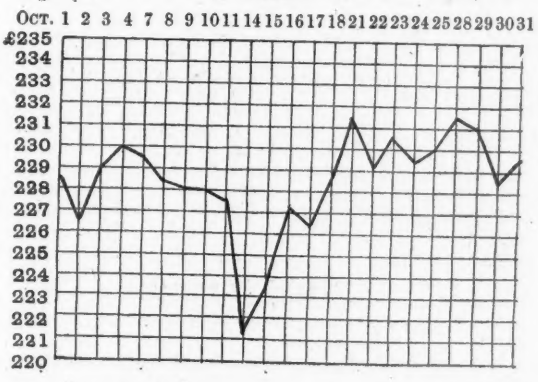
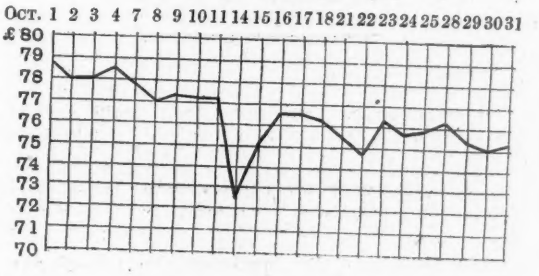


COPPER (G.M.B's.).



Dundee Electric Lighting.—In connection with the recently authorised extension of equipment for the local power stations, the Electricity Committee of the T.C. have agreed to Mr. Nairn, the convener, and Mr. Richardson, the engineer, visiting various electricity stations and manufacturers' works throughout the country. London, Manchester, Sheffield, and possibly Rugby, will be visited by the deputation.

SWEDISH EXPORTS OF ELECTRICAL GOODS.

THE following statistics of the exports of electrical and similar goods from Sweden in 1910 are very interesting as revealing a continuance of the development of the Swedish manufacturing position; figures for 1910 are given for purposes of comparison, and notes of increases or decreases have been added:—

	1909. Kronor.	1910. Kronor.	Increase or decrease. Kronor.
Electric incandescent lamps.—			
To Finland	30,000	31,000	+ 1,000
„ Russia	51,000	106,000	+ 55,000
„ Denmark	18,000	33,000	+ 15,000
„ Germany	11,000	47,000	+ 36,000
„ Great Britain	33,000	22,000	— 11,000
„ Argentina	38,000	26,000	— 12,000
„ Other countries ...	21,000	16,000	— 5,000
Total ...	202,000	281,000	+ 79,000
Dynamos and parts thereof.—			
To Norway	183,000	564,000	+ 381,000
„ Finland	80,000	149,000	+ 69,000
„ Russia	56,000	53,000	— 3,000
„ Germany	36,000	39,000	+ 3,000
„ Great Britain	27,000	93,000	+ 66,000
„ Spain	26,000	63,000	+ 37,000
„ Australia	43,000	113,000	+ 70,000
„ Canada	182,000	127,000	— 55,000
„ Other countries ...	94,000	32,000	— 62,000
Total ...	727,000	1,233,000	+ 506,000
Electric motors and parts thereof.—			
To Norway	2,000	302,000	+ 300,000
„ Finland	19,000	27,000	+ 8,000
„ Denmark	1,000	61,000	+ 60,000
„ Great Britain	59,000	119,000	+ 60,000
„ Spain	5,000	20,000	+ 15,000
„ Brazil	—	29,000	+ 29,000
„ Argentina	43,000	77,000	+ 34,000
„ Other countries ...	92,000	37,000	— 55,000
Total ...	221,000	672,000	+ 451,000
Transformers and parts thereof.—			
To Norway	6,000	75,000	+ 69,000
„ Russia	—	15,000	+ 15,000
„ Denmark	—	33,000	+ 33,000
„ Australia	—	37,000	+ 37,000
„ Canada	11,000	200,000	+ 189,000
„ Mexico	—	19,000	+ 19,000
„ Other countries ...	1,000	13,000	+ 12,000
Total ...	18,000	392,000	+ 374,000
Telephone instruments.—			
To Norway	51,000	77,000	+ 26,000
„ Finland	236,000	279,000	+ 43,000
„ Russia	719,000	1,372,000	+ 653,000
„ Denmark	595,000	224,000	— 371,000
„ Holland	65,000	160,000	+ 95,000
„ Great Britain	794,000	1,933,000	+ 1,139,000
„ Mexico	—	116,000	+ 116,000
„ Other countries ...	138,000	54,000	— 84,000
Total ...	2,598,000	4,215,000	+ 1,617,000
Petroleum and benzine motors.—			
To Norway...	359,000	477,000	+ 118,000
„ Finland	170,000	244,000	+ 74,000
„ Russia	1,808,000	2,527,000	+ 719,000
„ Denmark	86,000	206,000	+ 120,000
„ Germany	258,000	461,000	+ 203,000
„ Holland	64,000	292,000	+ 228,000
„ Great Britain	18,000	190,000	+ 172,000
„ Italy	162,000	150,000	— 12,000
„ Austria...	130,000	346,000	+ 216,000
„ Other countries ...	146,000	283,000	+ 137,000
Total ...	3,201,000	5,176,000	+ 1,975,000
Turbines.—			
To Finland...	42,000	41,000	— 1,000
„ Great Britain	1,000	72,000	+ 71,000
„ Canada	11,000	236,000	+ 225,000
„ Other countries ...	18,000	31,000	+ 13,000
Total ...	72,000	380,000	+ 308,000
Cranes, &c.—			
To Finland...	26 000	58,000	+ 32,000
„ Russia	9,000	186,000	+ 177,000
„ Other countries ...	62,000	66,000	+ 4,000
Total ...	97,000	310,000	+ 213,000

	1909.	1910.	Increase or decrease.
	Kronor.	Kronor.	Kronor.
Copper wire covered with textile threads.—			
To Russia	62,000	207,000	+ 145,000
„ Denmark	101,000	131,000	+ 30,000
„ Great Britain	99,000	96,000	— 3,000
„ Other countries ...	34,000	22,000	— 12,000
Total ...	296,000	456,000	+ 160,000
Steam engines.—			
To Russia	177,000	365,000	+ 188,000
„ Denmark	62,000	26,000	— 36,000
„ Argentina	—	23,000	+ 23,000
„ Other countries ...	59,000	39,000	— 20,000
Total ...	298,000	453,000	+ 155,000
Steam turbines.—			
To Russia	192,000	171,000	— 21,000
„ Finland	10,000	38,000	+ 28,000
„ Holland	20,000	35,000	+ 15,000
„ Other countries ...	47,000	19,000	— 28,000
Total ...	269,000	263,000	— 6,000

Krona = 1s. 1⅛d.

PROCEEDINGS OF INSTITUTIONS.

Institution of Electrical Engineers.—Manchester Local Section.

The inaugural address of the chairman, Mr. Arthur A. Day, was read on Friday last by Prof. E. W. Marchant, vice-chairman, Mr. Day being prevented by illness from attending. Mr. Day expressed the hope that, during his year of office, which coincided with a change of policy of the Institution under new articles of association, the Section would increase in numbers and importance, and that, under the new *régime*, they would experience that renewed vitality which the alterations had been designed to effect. As commercial and political considerations very materially affected the prosperity and progress of electrical engineering, it would generally be admitted that the change which had taken place was in the right direction, and he hoped it would lead, in the immediate future, to an enlarged prosperity for all branches of the electrical industry.

The application of electricity to everyday life was of national importance, inasmuch as it involved such large issues as the abolition of the smoke nuisance in our large towns, the conservation of our national supply of fuel, the utilisation of waste products, and many other problems of a like nature.

In making comparisons with other large industries, one was struck with the relatively small amount of export business done in English electrical machinery. This was one of the directions in which our Institution, in conjunction with the Government, might be able to help the manufacturers considerably.

The first essential to the increased use of electricity was a cheap and efficient supply; this they were now in a fair way to attain in large towns and cities, but notwithstanding this the increase in output was not advancing as it should. The main problem was commercial rather than technical, and it was in this connection that the importance of the change of their articles of association was shown.

The increased use of electricity involved doing everything on a larger scale, from power station to publicity.

In England there were far too many generating stations, and too great a variety in the types of current supplied, necessitating different classes of apparatus for its application. This prevented the manufacturer from producing in quantity, and so increased the cost of apparatus, and, moreover, it confused the ordinary man. Simplicity was undoubtedly a large commercial asset.

With the example of the different gauges of railways and tramways before them, was it not of the utmost importance that some effort should be made to ensure uniformity, if not in detail, in main essentials? Even in smaller matters very large economies were to be obtained by uniformity. Mr. Watson, in his address to the Section in 1909, pointed out that a capital saving of £500,000 could be obtained by the interconnecting of the electric supply networks of the towns just round Manchester.

Their supply stations and networks were going to be, in the future, infinitely larger than they were that day, and if extensions, when made, were controlled by certain general considerations, and plant, when replaced, was similarly dealt with, they would soon see a great difference, and a greater tendency to uniformity. It would not be necessary to aim at uniformity of the whole country on one system; the system most in use in any given area would, he supposed, be generally accepted as the system for that district.

If it were conceded that these things were desirable—viz.:—

1. Large generating stations with large units, &c., in the interests of low cost of production;

2. Co-operation between existing systems of supply, with a view to economising in the cost of station plant, and also in the cost of distribution;

3. Uniformity of systems of supply as far as practicable, and at any rate in adjoining districts, in the interest mainly of the manufacturer, but incidentally also of the consumer, by reason of the reduced cost of apparatus—

was it not within the scope of the Institution to do anything towards attaining these objects eventually, and moving in that direction now?

He suggested that committees should be formed of members of the Institution representing each interest involved, viz., supply authorities, manufacturers, contractors and the commercial community. They would obtain all information necessary for a thorough consideration of the question in the area they were appointed to inquire into, and would recommend the lines on which existing supply authorities should extend, and so on to a main committee, consisting of delegates from the sectional committees, who would consider and revise the whole of the recommendations, if necessary. Having through these Committees obtained the lines on which progress should be made, the Institution could approach the Government of the day, and seeing that the movement would be in the interests of all concerned and also in the interests of national economy and system instead of chaos, he saw no reason why the said Committee should not be allowed to co-operate with the Board of Trade and the Local Government Board, as these Government departments were important factors in the starting or extending of any supply undertaking, and would be able to influence considerably the type of supply started or extended.

The whole process would be gradual, and would be intended to prevent the extension of the present want of uniformity and cohesion between systems rather than the enforcement of any particular system.

It was essential that the Institution should be recognised more by the Government departments and taken more into their confidence. Without the assistance of the Government it would be practically impossible to carry out such a scheme as was suggested by Mr. Ferranti. Before such a scheme could be carried out it would be necessary, for example, to have compulsory powers for obtaining wayleaves; in the case of other interests such as railways and canals, it was recognised that private interests must, under proper regulations, take a secondary place, and the same principle ought to be recognised where energy was transmitted instead of goods and passengers.

Those who had had the responsibility of maintaining the continuity of electric supply during the past 12 months or so, had had brought home to them more forcibly than ever before the importance of electric supply to the community; and how much more important would it become in the case of the larger schemes foreshadowed. It would, indeed, be a matter of national concern. The Government seemed to realise the seriousness of the position judging by the anxious inquiries which they made during the strike as to how long the public supply was able to last. It seemed, therefore, a proper time to put forward a plea for a greater amount of co-operation with the Government. The danger was that, the cause of anxiety having for the time being more or less ceased, the matter would be shelved, and the obvious lessons to be derived from the strike lost sight of.

It should be a national matter to encourage any system of intensive culture of land, which would tend to lessen our dependence on foreign food. Electricity could be used in this direction. Was it too much to ask the Government for a grant, and to help generally to start this system on a large basis, seeing the national importance that the food supply might assume at any time? A larger production of the national food supply at home would enable a larger proportion of our fleet in time of war to be used in direct hostilities, instead of having to be employed in keeping our trade routes open.

A comparatively small sum would effectually prove its profitable nature to the farmer, who would then adopt it from commercial motives, and if not, it would be the Government's business to see that it was done. Was it not possible for our Institution, in conjunction with the Government, to do something in this direction?

Not only could electricity, from a nationally controlled scheme, be used directly in the interests of agriculture, but, by its use in the chemical production of artificial fertiliser by the fixing of the nitrogen of the atmosphere, or by its use in chemical processes generally, as in the manufacture of electrolytic bleaching powder, or for the production of disinfectant or the sterilisation of water, and generally by its use in processes which would be continuous, but which could be temporarily interrupted if necessary, a load factor hitherto undreamt of could be obtained for that scheme, with results in the cost of production that would be of the utmost importance nationally, and which, besides saving our national asset, coal, would probably lead to the introduction of other industries, which, without such a scheme, could never be started.

He did not plead for Government ownership; he did not believe that that would be beneficial, but he thought they should have more recognition and help from the Government, seeing that the application of electricity was so vital to public interests and touched national interests at so many points, and he hoped that, with their new articles of association, much more would be able to be done in the direction of influencing the Government to give to the science of the application of electricity to modern needs in every direction more consideration and encouragement.

Undoubtedly great advantages would accrue from a larger recognition of the value of original research in connection with the electrical industry. It would therefore interest them to know that the Institution of Electrical Engineers was taking this matter up seriously, and that that section was taking a prominent part in

it. They in England were not getting the share which they had been accustomed to get in the large industries of the world. The Institution of Electrical Engineers, representing the profession and industry of electrical engineering in England, had a responsibility in this matter that it dare not shirk, and whatever there was that they could do, must be done to keep the electrical industry in England in the front rank of the industries of the world.

A smoking concert was held after the reading of the address.

Yorkshire Local Section.

On Wednesday, the Chairman (Mr. S. D. Schofield) delivered his inaugural address at Leeds.

Proceeding to consider a few points in connection with electricity supply, he said that one lesson to be derived from the coal strike in the early part of this year was that it was incumbent upon all supply authorities to hold very large stocks of coal; six months' reserve stock was by no means excessive. It was becoming a common practice for large works to fall back on electricity supply undertakings when they found themselves unable to obtain coal for steam raising, and when breakdowns occurred, and temporary consumers thus secured often became permanent, and turned out quite profitable ones. This made it necessary to hold larger stocks of fuel than were formerly required. In providing for these contingencies it might, under certain conditions, be sound policy to supplement a coal reserve by storing low-grade oils. This might be done by using obsolete Lancashire boilers as storage tanks, fixing them in such positions as would allow the oil to gravitate to the front of the furnaces.

At their annual dinner in February, 1910, Dr. Kapp remarked upon the tremendous developments that were taking place in the electrical driving of textile factories; since Dr. Kapp first stimulated inquiry upon this subject, the manufacturers had found where their interest lay, and were adopting electric driving as quickly as it could be installed.

One of the main things to be considered in the future was the fixing of standard pressures and periodicities. Engineers interested in the manufacture of motors or incandescent lamps well knew what a boon this would be to them. The day of small supply stations was passing away, and if electrical energy was to be universally adopted for industrial purposes, at prices which would be profitable alike for the producer and consumer, it could only be done when generating with large units at stations where fuel could be obtained easily and cheaply, and where an abundant supply of water for condensing purposes was available.

The jealousy so often existing between local authorities might be a stumbling block in the way of group control. In past years this jealousy had often acted to the disadvantage of the community.

The practice of taking large sums of money from the profits of trading departments, said Mr. Schofield, was a very dangerous one. Let the prices in each trading department be adjusted to leave a fair margin over production or operating costs, as the case might be. If any sum had been taken from the rates in support of an undertaking in its early days, by all means let them return such sum to the rate fund. After providing for interest and sinking-fund charges, repairs, maintenance of plant, &c., let them provide a fund for replacing obsolete or uneconomical plant by more efficient units. Let them create and maintain a reasonable reserve fund, but not too large, as it offered too big a temptation to local chancellors of the exchequer, who naturally wished to keep the rates as low as possible. When all this was done, such short-life apparatus as meters, services, street-lighting equipment, motors and switchgear, cooking stoves, &c., should be paid for out of revenue. In his judgment, any undertaking which did that could be considered on a sound financial footing, and if there was still a large balance left it would be high time that a "Consumers' Protection Scciety" was formed.

One result of the very excellent plant now provided for electricity generation and distribution was a tendency on the part of engineers to become stereotyped in their methods, and in too many cases to refuse new business because it did not fall in with "red tape" conditions.

Additional consumers had often been obtained by the readiness of supply authorities and companies to step in and supply electrical energy at short notice, when the ordinary power units (steam or gas) had broken down. Apart from the particular advantage to the firm in difficulties, these cases were striking advertisements of the manifold advantages of electric driving, and of the ease with which electrical energy could be obtained in emergencies.

Supply engineers should be always open for business if there was a margin on the right side in it, even if it compelled them temporarily to overload plant and mains. In these days of first-class plant and standardisation, there was a tendency to practise caution until it ceased to be a virtue. The human element was an important factor in securing continuity of supply. In order to obtain the best results, diverse methods were necessary with different men. With one man the best method was stern discipline; with another, persuasion; another, "chaff"; while there was always that type of man known as a "sea lawyer" to contend with, and the busier this one was kept at work, the less time he had to interfere with others. Let them discourage favouritism and encourage ability. If a man was competent, steady and reliable, let them give him a certain amount of responsibility and latitude, make his position comfortable, and encourage him to think about his work. The average man would value his position all the more, and in an emergency would respond for all he was worth to get this machine ready, or that joint made, or the other motor fixed, or keep steam up, &c., as the case might be. Moreover, an appreciable amount of a chief's time in superintendence was saved, and the work went on as well and as quickly when the foreman's back was turned as when he was watching. It was a good thing for a junior to obtain a reputation as one who could be relied upon. There was no easy way to obtain it; it could only be acquired by hard work every day. He should study his own work until no one else could do it better, and very few as well; then study the work of the next man above him until he could do it better than the former.

He was now leaving electrical supply, and taking up an appointment of an entirely different kind, and he very much regretted that this, the first meeting of the session, was the last meeting of the Section which he would be able to attend.

A smoking concert was held after the meeting.

The Turbo-Converter; A High-Speed Direct-current Generating Unit.

By F. Creedy, A.M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers, *at Manchester, November 5th*, 1912.)

The present paper describes an attempt to supersede such a mechanical monstrosity as the high-speed commutator of the ordinary direct-current turbo-generator by a construction which, though differing from current practice, is far less objectionable.

The fundamental difficulty in the design of a direct-current turbo-generator is the collection of the current from the rapidly revolving commutator, and for this in spite of the engineering skill lavished on the subject there would appear to be no remedy, except reducing the rate of revolution of the commutator. Mr. H. M. Hobart proposed the use of an alternating-current generator driving a rotary converter of the ordinary type.

The present paper describes a new method devised by the writer, in which an alternating-current generator of the induction type feeding a rotary converter is employed, the induction generator being used at the same time as a species of electromagnetic gear. By this means it is possible to reduce materially the size of both the rotary converter and the alternating-current generator, since the output of the system is the sum of the outputs of the component parts, each of which therefore need only have half the capacity of the set.

The turbo-converter, then, in the form in which it has so far been developed by the writer, consists of an induction generator combined into one machine with a rotary converter, one member (preferably the primary) being mounted on the converter shaft and revolving with it, and the other, usually the squirrel-cage rotor, being mounted on the turbine shaft. Fig. 1 shows a diagram of connections of the device.

By mounting the generator primary on the converter shaft, instead of having it stationary as in Hobart's proposal, we make use of the driving torque required by the induction generator, or, in other words, the resistance which its rotor opposes to being revolved by the turbine, in order to drive the converter, which is thereby caused to generate direct-current in addition to its function as a converter.

Let us take, by way of example, a four-pole generator and four-pole converter. Let the converter be running at 1,500 R.P.M., and let the three-phase induction generator be connected to three-phase tappings on the converter armature through the hollow shaft.

At 1,500 R.P.M., three-phase currents at 50 cycles will flow through the tappings on the converter armature. These tappings are so connected that the revolving field of the induction generator rotates the same way as the converter armature. In a four-pole machine with 50-cycle excitation, the revolving field will also go at 1,500 R.P.M. relatively to the primary winding which produces it. Hence the total speed of the revolving field will be 3,000 R.P.M., the sum of its speed relative to its primary and that of the primary itself. The squirrel-cage rotor, and therefore the turbine, will go at approximately the same speed as the field. Hence we have obtained an apparatus in which the generator only runs at a fraction of the speed of the turbine.

In addition to its function as a direct-current generator, the converter changes the power of the induction generator, equal in amount to its own, into a direct-current form, and the total power flows out of the commutator of the set.

The reader will remark the analogy between the present apparatus and the well-known and very successful motor-converter of Bragstad and La Cour.

The reasons for the use of an induction rather than a synchronous generator, which would appear at first sight to be equally applicable, are few but conclusive:—

1. If a synchronous generator were employed, it would be necessary to synchronise the two revolving elements every time the set was started.

2. Owing to the presence of two sources of magnetisation in the set—one in the converter and one in the generator field—it would be possible for the set to "hunt" if overloaded, and for it to fall out of step if accidentally short-circuited and be incapable of picking up again.

3. Collector rings would be required on the high-speed element to excite the field.

The converter portion of a turbo-converter set will be distinguished from an ordinary rotary converter by a number of peculiarities of design:—

1. Owing to its function as D.C. generator, it will require more copper on the armature than a standard converter—exactly the

same amount, in fact, as the converter portion of a motor-converter.

2. As the field of the converter has to perform the double function of magnetising both converter and induction generator, it will necessarily be somewhat heavier than that of an ordinary converter.

The magnetising current of the induction generator, in fact, differs 90° in phase from the working current, and circulates in the converter armature in such a position as directly to demagnetise the field of the

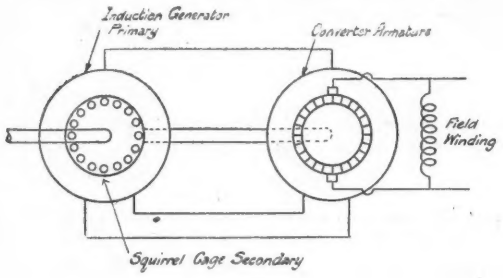


FIG. 1.

converter. This field, therefore, must be supplied with an extra number of ampere-turns sufficient to counterbalance the magnetising current of the induction generator.

3. The drop in speed of a turbo-converter set from no load to full load would at first sight appear to be considerable, as the "slip" of the induction generator is added to the drop in speed of the turbine.

However, if the ratio of speeds of the turbine and converter is, say, 2 : 1, the effect of the slip on the speed of the converter is reduced in the same ratio, so that the resultant drop in speed is much less than might have been anticipated.

If we neglect the slip, the general rule for finding the "gear ratio" of a set having any numbers of poles is as follows :—

"Divide the number of poles on the induction generator by the sum of those on the converter and the induction generator, and the result will be the ratio of the converter speed to that of the turbine on no load."

There should be no difficulty in a machine of any size in reducing the slip of the squirrel-cage induction generator to 2 per cent., so that its effect on the converter speed will be very slight.

The slip in the induction generator might appear to have a seriously injurious effect on the regulation of the set. However, investigation shows that while the series field of such a set requires to be a little stronger than on an ordinary generator in order to offset this, the effect of the slip is of quite small magnitude.

4. Such a set can very readily be employed as a three-wire set. All that is necessary is that the induction generator be connected in "star" and a tapping led from the neutral point to a collector ring, the brushes on which are connected to the neutral wire of the system.

5. The turbo-converter cannot be started from the steam turbine end without auxiliary means. The steam turbine and squirrel-cage rotor attached will start up alone, while the converter portion remains stationary without showing any tendency to start. It is

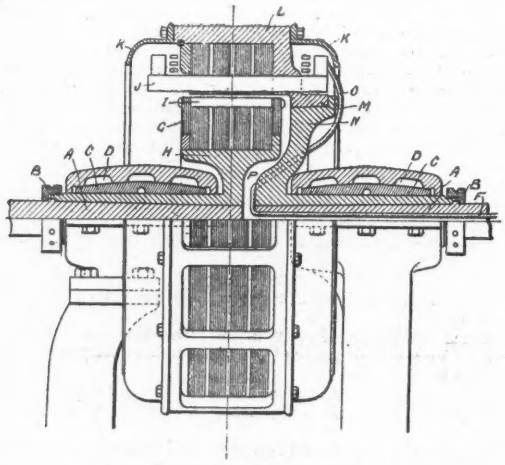


FIG. 2.

necessary to bring the converter up to a sufficient speed to generate enough voltage to excite the induction generator before the primary and secondary of the latter can get into step.

If a supply of direct current is available, the converter may be started up as a direct-current motor, when it will bring the turbine up with it to its rated speed of twice or more that of the converter. Steam can then be admitted, and the set will be ready for load. This is by far the best plan where applicable, but of course it requires an appreciable supply of electric power to enable it to be used.

One of the best mechanical methods is the following :—By means of an auxiliary idler shaft the turbine is belted on to the

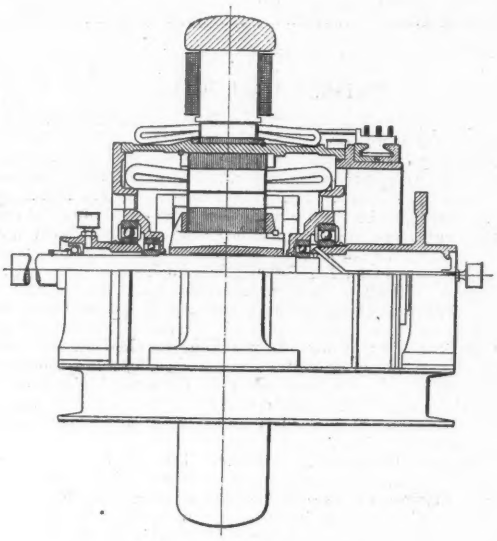


FIG. 3.

converter by the use of pulleys, which may conveniently be arranged to give the same velocity ratio as the induction generator. On starting the turbine, the converter is brought up to its correct speed by the agency of the belts, and as soon as the field switch is closed will be ready for load. The belts may then be run on to loose pulleys and the idler shaft stopped. This may be done by hand, or automatically by means of a solenoid operated by the voltage across the converter brushes.

Various other methods have been devised, but entail the risk of raising the converter to an excessive speed.

Two different forms of mechanical construction are possible for the turbo-converter. First, the type illustrated herewith (fig. 2), which may conveniently called the "fly-wheel" type; or, secondly, the "spinner" type, like the multiple-speed induction motor made by Mavor & Coulson, of Glasgow. In this type (fig. 3) the squirrel-cage rotor forms the inner element, and is driven direct by the turbine. Surrounding this is a second element, the "spinner" capable of free rotation and also supported by means of

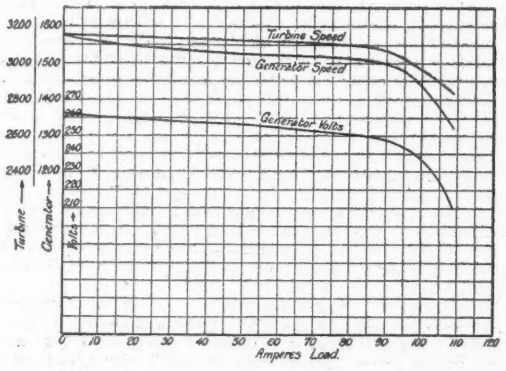


FIG. 4.—LOAD AND SPEED CURVES AS SHUNT GENERATOR (NO COMPOUNDING).

ball bearings or the like on the same bearing pedestals in which the squirrel-cage rotor runs. This element bears the primary winding of the induction generator on its inside surface and the armature winding of the converter on its outside surface, being fitted with a commutator and brushes in the usual way.

Outside of this again is the field ring of the converter, carrying the pole-pieces and their windings, &c.

The author, however, has hitherto devoted his attention chiefly to the other or "fly-wheel" type of design, perhaps chiefly because it permits of the use of a standard design of converter.

The cardinal feature of this is that both primary and secondary are "overhung," or, in other words, supported by a single bearing. The most essential feature of any single-bearing construction is to reduce the overhang of the centre of gravity of the overhung mass beyond the bearing-nose as much as possible. It will be found in every case that the design adopted enables us to reduce this overhang to a matter of a few inches beyond the bearing nose even in the most extreme cases, and for sizes of 500 KW. In order to do

this, an induction generator design of large diameter and short length must be adopted.

We need have no anxiety as regards the effects of centrifugal force on the primary. It is merely necessary to take care that the primary end connections are well anchored in any convenient way. The peripheral speeds of the secondary are also quite moderate. A squirrel-cage rotor is, of course, ideal for high-speed designs. As there is only one bar per slot, which can be pushed through from the end, there is no difficulty in thickening the overhanging lip of the slot sufficiently to take care of the centrifugal force of the bar.

The only point which need cause us any anxiety is the short-circuiting ring of the squirrel cage. This cannot be made of steel, as it must consist of a high-conductivity non-magnetic material. In this connection I wish to draw attention to the properties of aluminium for high-speed work. It will be found, on calculation, that for all high-speed work aluminium gives a factor of safety only inferior to that of good steel, on account of its extreme lightness. Probably some of the new light alloys are still better in this respect. At present prices, moreover, aluminium is, volume for volume, cheaper than any other material except cast-iron and an ordinary grade of steel, again on account of its lightness.

Hence, if we adopt the end-ring construction, in which the end ring G is made of rolled aluminium sheet, we have an ample factor of safety against centrifugal force.

Fig. 2 is a sketch, approximately to scale, showing the mechanical design of a 500-KW. induction-generator. It will be seen that the centre line of the secondary only overhangs the bearing nose by little more than an inch, while the slowly-revolving primary is overhung by approximately 9 in. We may estimate the weight of this, including everything, as not over 3,500 lb., so that with an overhang of 9 in. only and a speed of 600 R.P.M. we are well within the range of fly-wheel practice.

The cardinal features of the design used to obtain these results are two in number.

1. The primary frame is made of a non-magnetic material, in which a number of holes are cast corresponding to the stator slots. Through these holes the stator bars are brought, and so the stator winding is kept outside the frame.

By this means the overhang of the primary is reduced very much, as we do not have to allow space for the end connections inside the frame. The frame abuts solidly on the punchings all round, and there is no hollow space to cause mechanical weakness. There is ample room for the end connections, and they do not have to be cramped in any way; and there is ample ventilation for the end connections.

2. The other important feature of the design is the arrangement by which the joint between the two hubs on which the primary and secondary of the induction generator are built up is made inside the bearing instead of on the projecting part of the shafts in the usual way. This enables us to have a quite ample and rigid bearing surface, and yet only have a shaft extension of about 3 in. in the set considered. The distance between the ends of the two bearing brasses is only about 11 in., scarcely more than it would be with an ordinary flange coupling.

The machine, in general, consists of two forced lubrication, water-cooled bearings of large size, supporting respectively one end of the turbine and the secondary of the induction generator, and one end of the converter and the primary of the induction generator. Mounted on the turbine shaft A by a very long taper fit and keyway is a steel hub H on which the secondary of the induction generator is built up of punchings in the usual way, the end rings of the squirrel-cage winding G being of aluminium, in which holes are punched for the bars I, these being afterwards riveted over on the outside. The primary is built up within a frame L, provided with holes on one side, through which the insulated stator bars J pass. This frame is mounted by a taper fit of ample area and keyway on another steel hub N, similar in general design to that used for the secondary, which is again mounted by a taper fit within the bearing on the converter shaft A. In order to save the space taken up by a nut on the front end, these taper fits are arranged to tighten up from the back, as shown at B B.

The leads O F are brought from the primary winding through the hollow shaft to the converter.

Fig. 4 shows load and speed curves for the experimental machine as shunt generator. In these curves the turbine speed is shown to one-half the scale of the generator speed. Since half the speed of the turbine is the synchronous speed of the generator, the difference between the turbine and generator speeds read off on the generator speed scale is the slip in revolutions per minute of the induction generator. It will be seen that the load was limited by the capacity of the turbine, as this began to fall rapidly in speed above 90 amperes load with the set arranged as a three-wire machine in the manner described above. Load was applied to one side of the system only, the other side being left entirely unloaded. The maximum difference in voltage between the two sides corresponding to full-load current on one side and no load on the other was 3½ per cent.

Ghent Exhibition.—We have received a copy of a French booklet of 50 pages containing the complete regulations controlling the supply of electricity and lighting at the above exhibition. Anybody interested in the matter can peruse the publication at this office.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Alternating-Current Network Protector.

THE alternating-current network protector herewith illustrated has been designed to disconnect a defective transformer instantaneously, thus protecting the secondary network by preventing an overload on the remaining transformers and consequently any interruption of the service. The device is entirely electrical, being free from moving parts, and requires no adjustment or attention. In principle it is a series transformer possessing three windings—a primary connected in series with the primary of the step-down or service transformer, a secondary connected in series with the secondary of the service transformer, and a tertiary or auxiliary winding consisting of a few turns of heavy wire so designed that the ratio of current that will flow in them during short-circuits is high as compared with the current in the other coils. The primary and secondary windings of the device are provided with the same ratio of turns as the primary and secondary of the step-down transformer with which it is to be used. The protector is connected in line with the step-down transformer, so that during normal operation the currents in its primary and secondary windings oppose each other in direction, and as the ratios of the windings in the device and in the step-down transformer are equal, the excitation in the two windings of the device is also equal, and, the latter being connected in opposition, no current is produced in the short-circuited

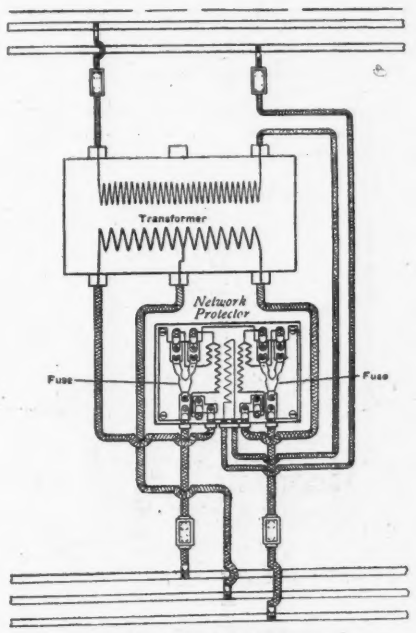


FIG. 1.—DIAGRAM OF CONNECTIONS.

coil. A diagram of connections for a three-wire secondary main is shown in fig. 1. One terminal of the primary of the step-down transformer is connected in series with the primary winding of the device. The terminals of the secondary of the step-down transformer are connected to the distribution main through the secondary windings of the device, as shown. In the engraving it will be noted that there are two V-shaped fuses, the bottoms of which are connected to the outer wires of the three-wire secondary network. One of the upper prongs of each of the fuses is connected to the end of its respective secondary coil, while the other prong of each of the fuses is attached to the third and heavy auxiliary winding as shown. The fuses act as a short-circuit connection on these auxiliary secondary coils, and the function of the combination is such that under normal conditions the currents in the primary and in the secondary coils of the protective device neutralise each other, so that there is no MMF circulating in the core of the series transformer to energise the auxiliary or heavier secondary winding. This balance is maintained at all loads and is upset only by a reverse current from the secondary network into the transformer, such as is occasioned by a short-circuit in the latter. This condition immediately reverses the relative polarity of the secondary coils, thus energising the core and causing a heavy short-circuit current through the heavier or auxiliary secondary winding by way of the short-circuiting fuses. The short-circuit current through the fuses immediately ruptures them and isolates the main terminals, so that the defective transformer is instantly cut out and disconnected from the line, thus permitting the remaining transformers connected to the network to continue their function of taking up the load of the defective transformer, without any resultant interruption to the service. The device is made by the Metropolitan Engineering Co., Brooklyn, N.Y.—*Electrical World.*

Wardle Lanterns.

A well-illustrated 24-page catalogue for 1912-13, which has been issued by the Wardle Engineering Co., of 196, Deansgate, Manchester, contains very full particulars of the "Streetlite," Watertight, "Beatark," "Onelite," "Drawlite," and "Vertolite" fittings, and brackets and accessories made by the firm. Views showing typical Wardle installations are also included. Our view,

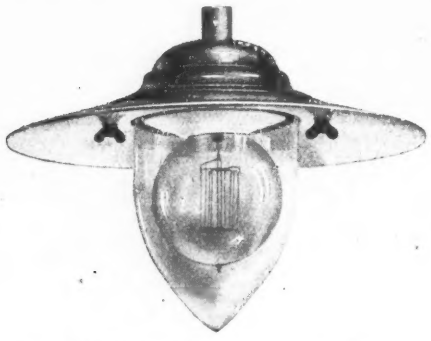


Fig. 2.—Wardle Watertight Fitting.

fig. 2, shows a 100-c.p. watertight fitting made in spun zinc or copper of heavy gauge; fittings of this type are made for single lamps of up to 1,000 c.p. and for clusters. Fig. 3 shows the "Vertolite" fitting for four 50-c.p. lamps.

This type of fitting is claimed to be the cheapest on the market, and is particularly suitable for interior illumination owing to the combination of direct and indirect lighting. An effective advertisement can be displayed on the bowl.

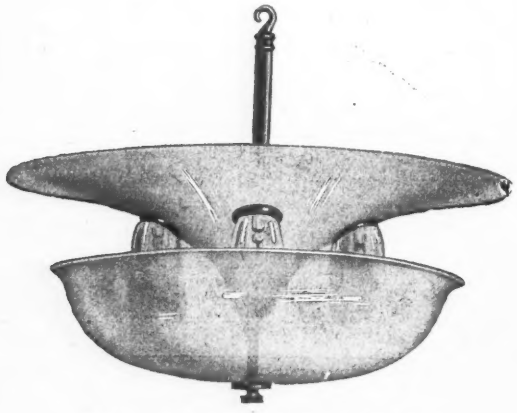


Fig. 3.—Wardle "Vertolite" Fitting.

The Wardle Engineering Co. are the actual manufacturers of the various fittings which they list, and have, we understand, built up a big home and foreign trade in their specialities.

The company has taken offices at 53, Victoria Street, S.W. (Tel. 5688 Vic.), where Mr. F. E. Phillips will continue to represent them.

New Simplex Oven.

Messrs. Simplex Conduits, Ltd., of 116, Charing Cross Road, W.C., have introduced a modification of their well-known "Combination Cooking Outfit," in the form of an improved oven, which is designed to give an increased rate of cooking with a decreased consumption of current by conserving all the heat and providing special means for circulation of the air. The case of the oven is made of highly polished metal, which successfully prevents any loss of radiation, and the heating element is the standard 10-in. size of boiling plate; the boiling plate is, when in use, enclosed in a separate chamber at the base of the oven, which practically forms a false bottom, the bottom itself being suitably heat insulated. In order to increase the top heat by circulation of the air, the sides of the oven carrying the shelves are fitted about ¾-in. away from the actual sides of the oven, giving a duct through which the heated air in the bottom chamber can circulate upward and around the dishes to be cooked.

It is found that this design increases the rate of cooking up to 20 per cent. over the ordinary form of oven, whilst the circulation of the air results in the temperature at the top of the oven being maintained at a temperature within a few degrees of the air at the bottom of the oven.

The price at which it is retailed is well within the reach of the average consumer, whilst the consumption is 1,000 watts with a three-heat control provided for by means of a switch. The internal dimensions are 15 in. × 12 in. × 10½ in., and it is therefore of ample size for a family of six or eight persons.

Electric Window-Display Devices.

To give point to the printed statement near by that his phonograph records are "entertaining," a St. Louis dealer in talking machines has a window exhibit with two round-ended cylindrical record boxes which follow each other with a succession of somersaults around the inclined table top. This odd effect is accomplished by rotating a pair of magnets inside the table beneath the path of the capsule-shaped tumblers, each of which contains a small iron ball, fig. 4. As the balls are drawn around under the attraction of the magnets, the capsules advance with a peculiar somersaulting action that arouses the curiosity of every passer-by.

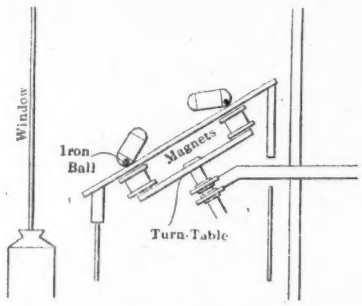


Fig. 4.—Window-Display Device.

Another curiosity-provoking stunt seen in a local drug-store window is a "perpetual-motion" machine made up of four widely advertised razors stuck into a large cork, the whole rotating on a nail point which bears on an inverted glass tumbler. Loiterers in front of the window offer many wise explanations of concealed magnets, commutating devices, &c., but the secret of the continued motion is an 8-in. electric fan hidden among some boxes at the rear of the window.—*Electrical World.*

E.A.C. Testing Rheostat.

The Electrical Apparatus Co., Ltd., of Vauxhall Works, South Lambeth Road, London, have introduced a new testing rheostat, by means of which a current can be regulated and held

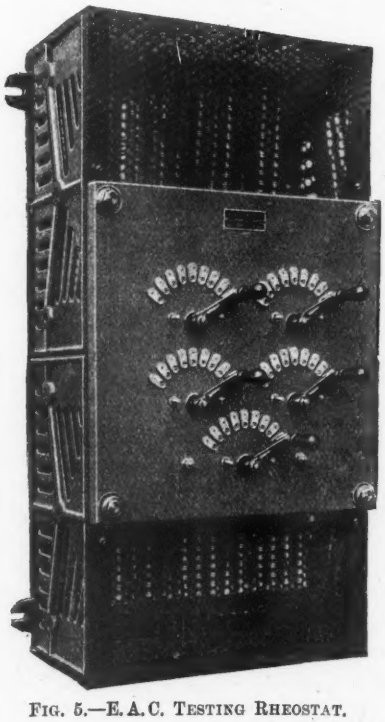


Fig. 5.—E.A.C. Testing Rheostat.

between full load and 1 per cent. of full load, in steps of 1/300th of 1 per cent. of the full load current. There are five 8-way regulating switches, each having a total resistance of ⅛th of the previous one, so that the sub-divisions of the last switch are one 1/30,000 of those

of the first. Owing to the negligible resistance temperature coefficient of the materials employed, a current once set will not alter appreciably. Every rheostat is arranged so that it is impossible to damage it on the voltage for which it is designed. A number of these rheostats have been supplied to central-station test rooms, factory testing departments, and standardising laboratories.

Galalith.

We recently visited the offices of the International Galalith Co.'s London agency, 6-8, Crutched Friars, E.C., to inquire into the electrical properties and capabilities of "Galalith"—that remarkable substance which is manufactured from skimmed milk, and consists of casein. In the simplest form, it is of the colour of cheese ("blonde" Galalith), and partakes of the nature of ivory, ebonite, celluloid and bone, in that it is elastic, tough, practically unaffected by acids, untouched by alkalis and ether, and quite non-inflammable. It appears, therefore, to combine many of the most advantageous features of the very dissimilar substances mentioned above. It can be turned and otherwise tooled with ease, taking a clean thread and a high polish; and it can be pressed and embossed whilst hot. Besides the natural colour, it can be had in over 80 tints, including excellent imitations of ivory, tortoiseshell, and coral, and in transparent qualities. It is not brittle like ebonite. The electrical properties of Galalith are also satisfactory, its resistivity dry being 13,500 megohms, and after soaking for 24 hours in water, 2,300 megohms per centimetre cube, as measured at Faraday House. The dielectric strength of a sheet 0·312 cm. thick was 11,000 volts.

On the other hand, its disadvantages are that, as indicated by the resistance test, it absorbs water, to the extent of 4·6 per cent. in 24 hours; there is no known solvent for it, and therefore, presumably, like ebonite, it cannot be perfectly joined by cement. These, however, are not serious drawbacks, and for parts of switches, &c., for use indoors, and similar purposes, it is an admirable substitute for porcelain, being practically free from risk of breakage, and being made in so many colours and patterns that it can be had to match almost any decorations. The raw material is supplied in long rods up to 18 mm. diameter, and in flat sheets up to 50 × 40 × about 15 mm. thick.

LEGAL.

The National Telephone Arbitration.

(*Continued from page* 726.)

Mr. Andrew Ogilvie, third secretary to the Post Office, in charge of the administration work of the telegraph and telephone branches of the Post Office, gave evidence as to the purchase of the Glasgow municipal telephone system by the Postmaster-General for some £305,000 on May 31st, 1906, and of the Brighton system for £49,000 on October 13th, 1906. In the case of Glasgow, the number of stations taken over was 12,821, a charge of £23·79 per station. In the Brighton case 2,000 stations were taken over at a cost of £24·5 per station. The Glasgow Corporation had a license running up to 1913, and the Brighton license ran to 1926, so these were both taken over as going concerns, and the price paid was for something beyond the mere value of the plant. A comparison of the number of stations on the two systems might not be a bad way of comparing the amount of traffic on the one system and the other, but it was a bad way of comparing the cost of the two systems. In the first place, in making such a comparison it would be assumed that the expenditure on each station represented the cost of construction, not more and not less, and that the quantity of plant in the stations of both systems was the same. In neither respect could there be any comparison in the case. Witness explained by detailed reference to the accounts of the Post Office how it came about that the amount given as capital expenditure greatly exceeded the cost of construction. So far as the amount of plant on the two systems was concerned, he agreed with Mr. Slingo's evidence that there was a much greater quantity of plant installed in the Post Office stations than in those of the company, and the quality was superior. Referring to the Glasgow installation, witness said it was opened in 1901, and a considerable portion of it was underground. Being a municipality, they had no difficulty in giving themselves wayleaves. The Brighton installation was also opened in the same year or in 1902. In 1911 the Glasgow stations numbered 11,843, or a reduction of nearly 1,000. This was owing to a cessation of competition between the business of the Corporation and the National Telephone Co. The competitors had offered their service at a rate of 25s. a year. When the competition ceased, however, and the agreements at this rate terminated, they were not replaced by new subscribers. From 1906 to 1912 out of 12,821 stations, no less than 5,172 stations were given up. Some 4,000 stations, however, were replaced by new subscribers at a higher rate, so that the net loss was a little under 1,000 stations. They were more successful in getting new subscribers at Brighton at the higher rate than they were at Glasgow. In the London system the company's figure for the number of exchange stations was 84,751, but witness said the correct figure was 79,342. On March 31st, 1911, the number of Post Office stations in London, including private wire stations, was 79,342, and in the provinces 42,388, a total of 121,730. On the same date in London the number of private wire stations was 5,192, and in the provinces 5,738. The capital expenditure on these was £818,504 in London, and £235,196 in the provinces. This expenditure made a total of £1,054,000, as compared with £991,000, the calculation made by the company. The number of wires on the Post Office system was 68 per cent. of the number of stations, and the wires of the company to its own stations only, were 56 per cent. That showed that the quantity of plant in use on the Post Office system was greater than that used by the company. In answer to further questions, witness said the estimated capital expenditure on telephone construction for the current year was £968,691, of which £449,408 was for London, £283,546 for the provinces, and £235,737 for trunk lines. That was exclusive of any expenditure on lands and buildings. To that there was to be added £1,831,000 for telegraph construction and maintenance. The ratio of cost of supervision to the cost of construction and maintenance together, was 12½ per cent. on the cost of labour and materials, but in that there was included the cost of the engineering supervision of the Post Office electric lighting plant, and other work which could not be properly debited to telephone construction and maintenance. Witness did not agree with the contention in the company's claim that the cost of obtaining subscribers' agreements should be reckoned as part of the working expenses of the service.

Cross-examined by Sir A. Cripps, Witness admitted that after the Post Office took over the municipal telephone service of Glasgow and Brighton, they had to raise the rates in order to make the service remunerative.

Re-examined, Witness said there was no basis for the assumption that Glasgow was carrying on its telephone system at a loss, or that it was glad to get rid of it to the Post Office.

Sir W. B. Peat, of the firm of W. B. Peat & Co., chartered accountants, was called on behalf of the Postmaster-General, and gave expert evidence respecting the calculations submitted by the company. He said he had not been able to ascertain the exact amount spent by the company out of revenue for capital construction, as he had only had access to the printed balance sheets. He should, however, very much doubt whether they had spent anything out of revenue on capital construction.

Mr. Danckwerts, K.C. (for the company): Well, really, how can Witness say that?

Witness replied that he based his assumption on the speeches of the chairman of the company, which were printed and circulated amongst the shareholders. In regard to depreciation, Witness said the company's tables were arithmetically correct, but he did not think they showed in a fair measure the amount of depreciation. The calculations were all right as a money table. They stated that in 20 years an instalment of £80,243 would, with interest at 5 per cent., yield £1,000,000. That was perfectly true, but that did not mean that within a period of 20 years the figures so given truly represented the actual amount of depreciation which would take place. Such a calculation would be all right if they were dealing with an annuity, which was a fixed amount recoverable from the person who had to pay it, or a lease which terminated on a fixed day. Both were capable of determination to an hour on a particular day, and the yield was a certain regulated sum, but a piece of plant was in an entirely different category. It might yield a profit on one day and a loss the next. It might live for 20 years or only 15; on the other hand, it might live for 25 years. A piece of plant did not pay interest unless it earned it, and then it was profit.

Mr. Buckmaster, K.C. (for the Post Office): And is this table of the company based on the assumption that a certain piece of plant will yield a certain percentage, viz., 8 per cent., throughout a fixed term of years?—Yes, there is the assumption that this 8 per cent. will be yielded with mathematical regularity throughout a period of 20 years. Five per cent. of this 8 per cent. was allotted for interest and 3 per cent. for sinking fund.

Witness added that a table of the character for the purposes of depreciation was perfectly useless. Secondly, even if it were useful, the 5 per cent. allowed for interest was unattainable with safety; and thirdly, assuming that the property was sold at the end of 10 years half of the life of the plant was gone, and if half its life was gone then half its value was gone.

Have you found this to be the case with commercial undertakings of which you have had experience?—Absolutely. I have had 35 years' experience and have never known a case where depreciation has been calculated on this basis.

Witness, continuing, said that a commercial company writing off depreciation could not afford to deal with the sinking fund in the way that had been suggested. A commercial company had to maintain its plant in an efficient state, and to do that it must employ the depreciation fund.

Mr. Buckmaster: You have to provide sums to keep the plant efficient?—Quite so. You have to write off an amount for depreciation in order to maintain the plant in an efficient manner and not put it into the sinking fund. My view is that the sinking fund in itself is an unnecessary element of speculation. To adopt the method of a sinking fund in order to ascertain depreciation is unjust as between buyer and seller.

Continuing, Witness said the balance-sheet for 1911 showed that a total sum expended on construction, exclusive of land and buildings, was £15,677,810.

Mr. Buckmaster asked if any of that sum was represented as purchase money for patents and goodwill of the business?—That was so.

How did you ascertain that?—By referring to the company's accounts, the speeches of the chairman, &c.

Mr. Danckwerts, K.C., said it would be better if the parties

were to go into the figures relating to the expenditure on the purchase of patents, &c., and endeavour to agree as to a figure.

Mr. Justice Lawrence said it would be more agreeable if the Court could have an agreed figure.

The Solicitor-General said he assented to Mr. Danckwerts's suggestion. The parties could meet and endeavour to agree upon a figure.

Further examined, Sir William Peat said the original figure put forward by the company as representing the cost of constructing its undertaking was £20,931,042, but the value was rather less There was a difference of upwards of £5,000,000 between the original claim of the company and the amount which its accounts showed had been expended on construction, exclusive of land and buildings. The sum spent on this latter item was £841,000. According to the company's figures, the value of the plant was £18,287,790, which meant that the company had realised that sum on an expenditure of £15,677,810, or a surplus of £3,000,000 odd. Assuming those figures were correct, then the company need not have written off any depreciation at all; on the contrary, it might have written on an appreciation.

Mr. Buckmaster: In other words, the plant increased in value rather than decreased, as the years went on?—The claim would certainly lead one to that inference.

Continuing, Witness said he had examined the company's table with reference to the depreciation of the plant, and, in his opinion, it did not disclose a proper measure of depreciation.

Mr. Percy Leake, of the firm of Messrs. Leake & Co., chartered accountants, Abchurch Lane, E.C., was then called. He said he was the author of a work entitled "Wasting Assets." He had estimated the value of the N.T. Co.'s plant at £11,146,621, after allowing for various considerations for and against the company's estimate, and taking the life of the plant at 30 years. Taking the 13 3 years of life assumed by the Post Office, he estimated the value of the plant at £6,914,232, the Post Office estimate being £7,334,794. In his opinion, if the company had spent the whole of its revenue on capital account, the value of the plant could not exceed £14,971,000. The method of estimating depreciation should be fixed by having regard to the length of life of the plant and the cost of construction, and reducing the cost of construction *pro rata* by the number of years of life that had expired. This was what was known as the "straight line" method. He agreed with the previous witness that the method of estimating depreciation of plant by a sinking fund was fallacious, because, taking an estimated life of 20 years for the plant, its maximum value would have been reached by the tenth year, and would be overstated by 25 per cent. as compared with the "straight line" method. Throughout many years of experience he had never heard of an industrial undertaking that invested money in a sinking fund to meet depreciation of plant. The original claim of the company was for £20,900,000, which at 3 per cent. would produce £615,000 per annum. Its dividends from 1907 to 1911 averaged 5 per cent. upon its capital.

Cross-examined by Mr. Danckwerts, Witness said that even on the highest estimate of the company, the valuation of the plant could not be more than £14,296,000.

Sir Hugh Bell, chairman and managing director of Messrs. Bell Bros., ironmasters and colliery proprietors, of Middlesbrough, stated that he was associated with a good many industrial enterprises in the North of England. His company had invested capital of about £1,500,000, and their output of steel was 1,000 tons a day. They consumed about a million tons of coal a year.

Sir J. Simon: Has your attention been called to the sinking fund method suggested for adoption by the company, in order to arrive at the measure of depreciation?—Yes.

In your experience, have you ever heard of any sale of plant which has been conducted on that basis?—I do not remember any.

Do you think that such a method is a true guide?—No, because it assumes that at any moment during the currency of the sinking fund, the fund will be sufficient to meet requirements. It is obvious that the sinking fund only suffices to meet requirements at the termination of its purpose, and not during its currency.

If you wanted to ascertain the value of a plant which had reached some intermediate stage of its life, do you think you could apply the sinking fund method?—No, I do not.

Cross-examined by Mr. Danckwerts: Suppose the earning power of a piece of plant increased, how would you deal with it then?—I am at a loss to understand how it could increase.

Well, take a telegraph pole; supposing you put an extra arm or an extra set of wires upon it, then you would increase its earning power?—If you did that you would not have the same piece of plant. You would have altered its character. But even then, although you may have succeeded in making it do more work it would not be worth any more money to buy.

Is it not common experience that plant decreases more rapidly in value towards the end of its life than in its earlier stages?—Oh, yes, of course it does. As a matter of fact, one maintains one's plant so that it will do its work until it is pulled out. It might, perhaps, not do its work so well in the twentieth year of its life as in its fifteenth, but substantially it does its work until the end, and you may disregard that progressive deterioration which obviously must be admitted.

Sir Geo. Gibbs, chairman of the Road Board, said he was the general manager from 1891 to 1906 of the North-Eastern Railway Co. In 1906 he took over the control of several London underground electric railways. During the time he was manager of the North-Eastern Railway Co. the aggregate capital expenditure of the company was £17,000,000, and the aggregate expenditure on working, maintenance, &c., £75,000,000. The capital expenditure of the three underground tubes—the Bakerloo, the Piccadilly and Brompton, and the Charing Cross, Euston and Hampstead Railways—between 1906 to 1910, when he severed his connection with the undertakings, amounted to about £16,000,000. In the course of his experience he had often had to consider problems which arose in connection with arriving at the value of plant. He was constantly concerned in arranging for contracts for the construction of works, and had had to consider the question of proper charges to be made in respect of them.

Sir J. Simon: The method adopted by the Post Office, as you have doubtless seen, in arriving at the reinstatement cost, was by means of allowing a percentage for administration, an additional percentage for the further element of contractors' profits, and then 5 per cent. for what was known as employers' burden. Is that, in your opinion, a proper method to employ?

Mr. Danckwerts (to Witness): Have you had experience as a contractor?—No, not as a contractor.

Mr. Danckwerts (to the Commissioners): Then I submit that the witness is not competent to give evidence as to what a contractor would do.

Sir J. Simon: Throughout witness's business life he has had to consider the way of arriving at the value of the employers' burden.

Witness said he understood he was asked his view as to the method in which the claim in the present case was dealt with, viz., by taking a complete total to cover everything and for the purposes of examination and investigation dividing that total into four elements: the fundamental cost, the contractors' management and supervision charges, the contractors' profit and the employers' burden. He considered that the division of the total into these four heads was a very convenient method of analysing the cost and forming a judgment upon the matter.

Sir J. Simon: Take the last item; the addition of 5 per cent. upon what would be the contractors' charge, have you had to consider over and above the contractors' price what is the burden which falls upon employers?—Yes, in fact the underground enterprise was just such a case. It comprised the contracting for and building an amount of work running into an expenditure of 18 millions of money, and composed of a great variety of elements. The Underground Co. was in the position of the assumed employer, and the kind of questions I had to consider in connection with that work were exactly on all fours with the questions we are dealing with now, namely, to ascertain upon what terms practically and commercially you could secure contracts for the carrying out of a telephone system, the agreed fundamental cost of which was £10,000,000.

Did you in all your tube work place the construction work out to contractors?—Yes, the Underground Co. was just in the position of an employer, or the owner and financing company for the concern. All the contracts had to be placed with various contractors.

And over and above the total sums paid to the contractors you had to consider what was a proper sum in addition?—Yes, I had to consider every branch of expenditure in estimating the total.

Witness said that the amount of 5·61 per cent. worked out in the Post Office figures to represent the expenditure which fell upon the employer, known as the employers' burden, was quite a sufficient allowance. That percentage represented a figure of £578,000, which was ample to cover administration and supervision of construction, payment made to consulting engineers, &c. To that figure was to be added the total contractors' charges which made up an absolutely exhaustive classification.

Sir J. Simon: If the materials and labour up to gang foreman cost £10,000,000 odd, would a charge of £7,800,000 for local supervision, engineering, contractors' profits and employers' burden be reasonable?—All I can say is, I should like to be the contractor. The mere statement of such a figure is sufficient to show that there has been an extraordinary over-estimate.

What do you say to the reasonableness of the charge of £4,300,000 for contractors' supervision and profit?—It seems utterly unreasonable.

Have you ever come across such a charge as that before?—Never.

Witness, continuing, agreed with previous witnesses—that the method of arriving at the value of plant by means of a sinking fund was fallacious. Nor did he think that the cost of raising capital should be regarded as part of the cost of construction.

At this point Sir A. Cripps said that if it were convenient for the Solicitor-General, he being himself at saturation point, would suggest that at the close of the evidence they should proceed with the argument on the main part of the case. In the meantime, he thought a considerable advance might be made in the endeavour to arrive at an agreement on outstanding matters. If that were done, he had every hope that in, perhaps, three weeks, the Court would be in a position to consider a lump sum award.

The Solicitor-General said he had still some evidence to call; it was mainly corroborative, and after that he agreed with his learned friend that it would be most convenient to proceed with the main argument, because if there were an interval they would probably forget more about the evidence than they were ever likely to learn from a study of the shorthand notes.

Mr. Justice Lawrence said that when counsel had finished, the Commissioners would have to put their heads together, and it would be very convenient to have the arrangement about outstanding matters before them, including the question of land and buildings, so that they might all be put into the judgment.

Sir A. Cripps said the parties were trying to see how near they could come to each other on outstanding matters, and both the Post Office and the company were doing their best in that direction.

Sir George Gibb, in cross-examination by Sir Alfred Cripps, admitted that nowadays Parliament, in the construction of a new line, allowed interest to be paid out of capital during the construction work. Until recently, however, it was illegal. That charge for interest, said witness, would count as part of

the capital, but not as part of the capital cost, because it did not represent any asset, and capital cost applied only to money expended on usuable and realisable assets. The other was a mere book-keeping entry, which did not add to the value of the plant in the least.

At a later stage in the proceedings, the Attorney-General said he had had an opportunity of discussing and carefully considering with those associated with him, the body of evidence which had been called, and they had come to the conclusion that they would jettison a fair body of the general evidence which it was intended to call. They, therefore, hoped to conclude the evidence on the valuation of the plant that day. In regard to the conclusions the Court might arrive at, he was anxious to have a reasoned judgment on the mains heads.

Mr. Justice Lawrence said they were bound to give a reasoned judgment. If both sides wanted items dealt with specially, the Court would do their best to do so. It had never been his intention since the Attorney-General protested against a lump sum award to abstain from giving a reasoned judgment. It would be more convenient to give a sum in one amount, but he would hear any arguments upon adopting that course at a later stage.

Referring to other particulars in the company's claim, Sir Rufus Isaacs said they were small matters upon which it was impossible for his clients to arrive at a conclusion in their own minds until they had more information supplied by the company. He had mentioned the matter to Sir A. Cripps, and he had no doubt they would be able to agree as to what particulars should be given by the company, but should any question arise during the time the Court was considering its award as to the further information that they were pressing for, he would suggest that the parties might approach the Commissioners in chambers.

His Lordship said it would take some days before the Court could deal with the mass of figures presented and come to a conclusion. If during that time any assistance could be given by the Court, they would be happy to give it.

Sir A. Cripps agreed with the suggestion, and said he would endeavour to supply further information required.

Evidence was then given by Mr. Henry Sparks, a staff officer in the Stores Department of the Postmaster-General, to show that according to the contention of the Post Office, there was little or no charge that could properly be levied for storage during construction.

(To be continued.)

Edinburgh Tramways Co. Sued.

"If the notice board says a car will stop and it does not, then it is a delusion and a snare," remarked Sheriff-Substitute Guy, in giving decree for £10 to a cab proprietor who sued the Edinburgh and District Tramways Co., Ltd., for damage done to a cab, which was run into by a cable car. The driver of the cab said that, owing to a notice board at an "island" stating that cars stopped, he thought he was safe, but the car did not stop, and the collision occurred. The cable car driver, on the other hand, asserted that the drivers had no instructions to stop at any "island" unless they got the "bell" to do so.

Tramway Obstruction.

A point in an alleged tramway obstruction case was decided last week by Sheriff Shennan at Hamilton. The Lanarkshire Tramways Co. brought a complaint against J. Wilmot & Sons, showmen, for having, with a traction engine, obstructed the tramway line at Blantyre for 40 minutes. The Sheriff dismissed the complaint, holding that it was wrongly brought, in respect that the essence of the charge was wilfulness, which could not apply to the firm, but to the manager or servant of the respondents.

Weber & Co., Ltd.

In the Companies' Winding-Up Court, Mr. Justice Neville heard a petition by the County of London Electric Supply Co., Ltd., for the compulsory winding-up of the above company.

After hearing Counsel, his Lordship thought no case had been made out for going against the wishes of the majority of the creditors, and dismissed the petition.

Indo-European Telegraph Co., Ltd.

In the Companies' Court, Mr. Justice Neville heard a petition by the Indo-European Telegraph Co., Ltd., asking the Court to sanction a special resolution passed by the company for the alteration of its memorandum of association for the purpose of extending its objects. The proposals were reported in our issue of August 9th last, p. 227. There was no opposition to the petition, and his Lordship sanctioned the alteration of the memoradum as proposed.

Darwen Electricity Supply.—An inquiry has been held into the application of the Corporation for sanction to borrow, among other amounts, £6,650 for the purpose of extending the plant, &c., at the electricity works.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

Amendments.

NEW ZEALAND.—The New Zealand Customs Authorities have decided that shaft couplings (to couple a steam engine to an electric generator) are to be dutiable at the rate of 20 per cent. *ad valorem* if of British origin, and 30 per cent. *ad valorem* if foreign.

The Board of Trade have received a cable from H.M. Trade Commissioner in New Zealand, reporting an alteration in the Customs Tariff with regard to the duty leviable on telephones imported into the Dominion. The effect of this alteration is to admit free of duty, telephones which are the produce of some part of the British Dominions, and to levy a duty of 10 per cent. *ad valorem* on all foreign telephones.

SOUTH AFRICA.—The Union of South Africa Customs Authorities have decided that railless trolley 'buses are to be dutiable at the rate of 12 per cent. *ad valorem* if of British origin, and 15 per cent. if foreign.

DENMARK.—The Danish Customs Authorities have decided to levy duty at the rate of 28 öre per kg. on the following goods:—Lamp-shades or globes, consisting of pieces of coloured glass framed with lead and furnished with a metal rim; lamp globes, colourless, but with completely opaque ground.

FRENCH WEST AFRICA.—A new tariff is to come into force on January next. The items in this new tariff which particularly interest readers of the Electrical Review are the following:—

Boilers, steam engines, other motive machinery, motor and engineering apparatus of all kinds, detached parts of such machines and apparatus...	3 % ad val.
Iron and steel for constructional works	5 % ad val.
Fixed and rolling stock for railways and tramways, except articles of woodwork for fitting up the inside of carriages, imported separately	3 % ad val.
All other articles not separately mentioned in the tariff and not included in the free list	10 % ad val.

The free list includes scientific and precision instruments and apparatus (not including photographic instruments or medical and surgical instruments and apparatus).

Note.—The value of goods on which duty will be calculated will be the value in the country of origin, plus cost of packing, freight, insurance, and other expenses up to the port of arrival.

BARBADOS.—*The Board of Trade Journal* publishes a notice calling attention to an Act passed by the Government of Barbados to establish a preferential tariff in favour of British goods. This Act will come into force at the same time as the Canada—West India Treaty. The preferential rates of duty provided for will be applicable to goods, the produce or manufacture of any British country if imported directly from that country, which have been landed only for transit and kept in bond for that purpose. Proof of origin will be required with the bill of entry at the Customs House. Every manufactured article to be admitted under the preferential tariff must be *bona fide* the manufacture of a British country and a "substantial portion" of its value must have been produced by labour in one or more of such countries. The following are the chief proposals of interest to readers of the Electrical Review:—

	Proposed rates. Br. pref. tariff.	Proposed rates. General tariff.	Present rates, applicable to goods of whatever origin.
Copper in sheets, rods, bars, &c., per 100 lb.	4/2	4/2	4/2
Yellow metal in sheets, per 100 lb.	4/2	4/2	4/2
Electric dental appliances ...	8%	10 %	10%
Lamps and lamp chimneys ...	9%	11¼%	10%
Wire...	9%	11¼%	10%
Machinery, including motor and other engines, steam boilers, and electric machinery (mentioned in the free list) ...	free	2 %	free
Ditto, not mentioned in the free list	8%	10 %	10%
All other articles not mentioned in the Tariff or in the free list	10%	10 %	10%

Advertising in China.—As our readers are well aware, trading conditions in China demand a style of advertising different from our own. We have before us an illustration of an Osram lamp advertisement published there by the General Electric Co., Ltd., and we hear that circulars and pamphlets regarding Osram lamps are also now drawn up in characteristic Chinese style. Already excellent results have been obtained.

NEW PATENTS APPLIED FOR, 1912.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

23,977. "Electric illuminated revolving advertising apparatus." J. W. Horton. October 21st.

23,993. "Apparatus for automatically operating gas or electric lamps." C. R. Oliver. (Addition to 23,789, 1911.) October 21st. (Complete.)

24,021. "Electric burglar alarm for doors." J. Gabriel. October 21st.

24,023. "Fittings for electric lamps." H. Garde. October 21st.

24,032. "Electric switching devices." H. S. Hatfield. October 21st.

24,043. "Electrical relays." S. G. Brown. October 31st.

24,046. "X-ray apparatus." H. C. Snook and E. W. Kelly. (Convention date, October 27th, United States.) October 21st. (Complete.)

24,051. "Electrodes for use in producing endothermic gas reactions." H. Pauling. (Convention date, October 24th, 1911, United States.) October 21st. (Complete.)

24,058. "Manufacture of wire." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 21st.

24,059. "Resinous condensation products." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 21st.

24,060. "Resinous compositions." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 21st.

24,066. "Electric propulsor." B. P. Gomez. October 22nd.

24,071. "Protectors for incandescent electric lamps." D. L. J. Broadbent. October 22nd.

24,073. "Electrically-operated suction cleaners for the extraction of dust and the like." Armorduct Manufacturing Co., Ltd., P. W. L. Camps, and W. Schmahl. October 22nd. (Complete.)

24,089. "Electromagnetic apparatus applicable for telephonic and the like signalling and other purposes." M. S. Conner and A. R. Kahl. October 22nd.

24,097. "Parallel working of synchronous machines." E. C. R. Marks. (Akt. Ges. Brown, Boveri et Cie., Switzerland.) October 22nd. (Complete.)

24,131. "Electric heaters." J. Nathan. October 22nd.

24,136. "Method and means for the intensification of intermittent impulses." A. M. Nicolson. October 22nd.

24,142. "Electric organs and other musical instruments." J. R. C. Gale. October 22nd.

24,154. "Base fittings for electric incandescent lamps." W. E. Lake. (Geb. Jaeger, Germany.) October 22nd. (Complete.)

24,180. "Controlling switch." J. Pihlens. October 23rd.

24,183. "Electrical step-by-step mechanisms." I. H. Parsons and A. E. J. Ball. October 23rd.

24,203. "Cold electrolytic process for the recovery of tin from waste tinned metal and alloys." A. L. C. Nodon. October 23rd. (Complete.)

24,237. "Metallic armouring of insulated electric cables." A. H. Howard. October 23rd.

24,243. "Arc lamps." H. Weiss. October 23rd.

24,254. "Resinous condensation products and process of making the same." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 23rd.

24,255. "Plastic condensation products." British Thomson-Houston Co, Ltd. (General Electric Co., United States.) October 23rd.

24,260. "Rheotomes." R. Eisenmann. October 23rd.

24,263. "Trolley arms used in electric tramcars, telphers and the like." R. Dempster & Sons, Ltd., and J. W. Broadhead. October 24th.

24,274. "Secondary electric clocks." W. J. Parker. October 24th.

24,289. "Electrical fittings, stoppers for jars, and the like." A. Waltho. October 24th.

24,313. "Electromagnetic apparatus for driving the pendulums of electric clocks." A. Jabs. (Convention date, October 25th, 1911, Germany.) October 24th. (Complete.)

24,317. "Sterilising appliance for application to telephone mouthpieces and the like." C. W. Akers and S. L. Lightfoot. October 24th.

24,343. "Brushes or collectors for electrical machines." W. E. Lake. (Société Anonyme le Carbone, France.) October 24th.

24,345. "Aerials for use in wireless telegraphy." E. Girardeau. (Convention date, October 25th, 1911, Germany.) October 24th. (Complete.)

24,349. "Electrical deposition of metals and apparatus therefor." C. D. Burnet and A. P. Stohmenger. October 24th.

24,353. "Hinge-lock, specially adapted for controlling an electric switch or switches." H. W. Firth and F. W. Leake. October 24th.

24,361. "Manufacture of metal-filament electric lamps." W. L. Pakenham. October 24th.

24,372. "Switches for overhead trolleys." J. Straiton. October 25th.

24,384. "Switches for overhead trolleys." J. Straiton. October 25th.

24,389. "Electrical resistances or current-graduating devices." Dimming Switches, Ltd., and W. L. Barber. October 25th.

24,404. "Electrodes for secondary or storage batteries, and the manufacture and construction thereof." G. Horley. October 25th.

24,406. "Electrical resistances and condensers." H. W. Sullivan, C. E. Hay and A. D. Hughson. October 25th.

24,408. "Electric telephones." L. G. Hammer. October 25th.

24,409. "Impulse transmitters for electrical circuits." (Convention date, December 7th, 1911, United States.) W. M. Bruce, Jun. October 25th.

24,435. "Electromagnetic ore separators." G. Rietkotter and P. Claes. October 25th. (Complete.)

24,438. "Miners' electric safety lamps." O. Oldham. (Addition to 24,787, 1911.) October 25th.

24,439. "Contact-breaker for electric bells and the like." Sterling Telephone and Electric Co., Ltd., and F. G. Bell. October 25th.

24,443. "Component parts of electric batteries." H. F. Joel, sen. October 25th.

24,484. "Arrangement of the exciting windings of the rotating field systems of electric machines." F. Ljungstrom. (Convention date, October 26th, 1911, Sweden.) October 26th. (Complete.)

24,492. "Pipe unions or couplings for electric conduit junction boxes and other purposes." F. H. Terry, H. M. Bigwood and Brotherton Tubes and Conduits, Ltd. October 26th. (Complete.)

24,499. "Electromagnetic suspension devices." B. Graemiger. (Convention date, October 27th, 1911, Germany.) October 26th. (Complete.)

24,502. "Circuit connection for electrical installations, with mixed loads." Landis & Gyr. (Addition to 22,591/12. Convention date, November 23rd, 1911, Switzerland.) October 26th. (Complete.)

24,503. "Tariff electricity meter." Landis & Gyr. (Convention date, October 27th, 1911, Switzerland.) October 26th. (Complete.)

24,516. "Portable automatic electromagnetic lampholder." F. D. T. Cameron and R. Law. October 26th.

24,540. "Switch for battery of lamps." C. Carangelo. October 26th. (Complete.)

24,541. "Electromagnetic suspension devices." B. Graemiger. (Addition to 24,499 of 1912.) (Convention date, July 3rd, 1912, Germany.) October 26th. (Complete.)

24,550. "Electromagnetic ratchet feeding devices." G. A. Vassberg. October 26th. (Complete.)

24,563. "Ignition devices." W. M. Mordey. October 26th.

24,571. "Renewing metallic-filament incandescent electric lamps." F. Harrison and F. L. Harrison. October 26th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1911.

Circuit Interrupters. F. W. Harris. 21,903. October 4th. (October 8th, 1910.)

Alarm Signalling and Controlling Devices. A. Richter and E. H. Bock. 21,959. October 5th.

Telephone Switchboards. E. S. McLarn. 22,046. October 6th. (October 7th, 1910.)

Couplings for Electric Conductors. A. J. Buckland. 22,138. October 7th.

Electrically-Driven Receipting and Cash-Registering Till. Mrs. H. Godefroid. 22,232. October 9th. (October 10th, 1910.)

Electric Signalling Apparatus for Telephones and the like. G. H. Nash and Western Electric Co. 22,238. October 9th.

Signals for use in Wireless Telegraphy. O. Angelini. 22,443. October 11th.

Telephonic Transmitters, Receivers and other like Diaphragm Instruments. A. Marr. 22,582. October 13th.

Windings of Electric Generators and other Electrical Machines. P. R. Jackson & Co., Ltd., and R. Ainsworth. 23,548. October 25th.

Systems of Arrangements for Indicating the Names of Stations on Trains and for Analogous Purposes. Siemens Bros. Dynamo Works and E. P. Barfield. 23,998. October 30th.

Electric Water Heater and Steam Generator. A. P. Nichols. 24,486. November 3rd.

Electrically-Operated Motor Vehicles. Crompton & Co., Ltd., J. C. Macfarlane and H. Burge. 24,778. November 7th.

Pawls of Electric Controller Regulators. S. Smith, A. Fleming and T. Guerin. 26,291. November 24th. (Cognate application, 29,060 of 1911.)

Electrically-Operated Motor Vehicles. Crompton & Co., Ltd., J. C. Macfarlane and H. Burge. 26,408. November 25th.

Electric Welding Machines. British Thomson-Houston Co. (Allgemeine Elektricitats-Ges.) 26,645. November 28th.

Audible Electric Signalling Devices and the like. T. S. Rogers. 26,909. December 1st. (Addition to 23,802 of 1909.)

Dynamo-Electric Induction Machinery. Akt.-Ges. Brown, Boveri et Cie. 28,388. December 16th. (December 16th, 1910.)

Spinning or Twisting Machines with Separately and Electrically-Driven Flyers. H. Schneider. 29,145. December 27th.

1912.

Vapour-Electric Apparatus. P. C. Hewitt. 183. January 2nd. (January 3rd, 1911.)

Electric Power-Factor Indicators. British Thomson-Houston Co. (General Electric Co.) 193. January 2nd.

Contact Apparatus for Electric Indicators for Indicating the Direction of Rotation of a Shaft. P. Molinari. 2,355. January 29th.

Electric Heating Element. H. J. Dowsing and D. Huntley. 3,253. February 9th.

Electric Animal Exterminators. O. N. Calvert. 3,540. February 12th.

Transmitter for Printing Telegraph Systems. P. Etienne. 4,585. February 23rd. (February 24th, 1911.)

Time-Controlled Mechanism for Electric Switches. R. Haddan. (Copeman Electric Stove Co.) 5,985. March 9th. (Divided application on 22,001 of 1911.)

Electrically-Actuated Pumps for Elastic or Non-Elastic Fluids. W. Richardson. 6,004. March 11th.

Multiple Control of Electric Motors. R. Richter and Maffei-Schwartzkopff-Werke Ges. 6,624. March 18th. (April 21st, 1911.)

Automatic Protection Device for Electric Circuits. P. M. Levy and H. T. George. 8,690. April 11th.

Apparatus for Controlling Direct-Current Electric Motors. Siemens Bros. Dynamo Works and F. Lydall. 9,876. April 25th.

Electrically-Driven Developing Apparatus, chiefly for Writing Telegraphs. A. E. Rappenecker. 13,328. June 6th.

Protecting Devices for Telephone Apparatus or the like. Siemens and Halske Akt.-Ges. 13,853. June 13th. (December 22nd, 1911.)

Dynamo-Electric Machines. Allgemeine Elektricitäts-Ges. 15,589. July 3rd. (July 3rd, 1911. Patent of addition not granted.)

Method of Carrying out Chemical Gas Reactions by Means of an Electrical Discharge. H. Andriessens and J. Scheidemandel. 16,296. July 12th.

Telephone Mouthpieces. E. Björnson and J. Hilditch. 17,171. July 23rd.

Electrical Measuring Instruments. E. Fauvin, E. Amiot and E. Cheneaux. 18,214. August 7th. (September 6th, 1911.)

Mica in British Columbia.—The Provincial Government of British Columbia is about to investigate the commercial possibilities of the mica deposits on Mica Mountain at Mile 53, B.C., on the line of the Grand Trunk Pacific Railway. According to a Government official, the deposit is at a height of 5,000 ft. above the level of the sea on a mountain the summit of which is covered with from 4 ft. to 5 ft. of snow. With the advent of the railroad the development of the mica deposit becomes a matter of commercial importance. It is said that the beds on Mica Mountain will yield sheets up to 10 ft. sq.—*Financial News.*

Fire.—Messrs. Falk, Stadelmann & Co., Ltd., desire to acknowledge the sympathetic messages received in connection with the fire which occurred on Sunday morning last at their premises in Great Saffron Hill, London. Whilst the damage to the building involved has been very considerable, the bulk of the warehouses are intact, and they are, therefore, in a position to carry on business without any interruption, and are quite able to cope with all orders as received.